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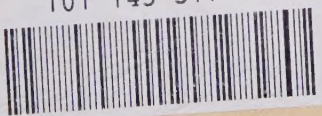

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GENERAL PREFACE

In the second Part of my *Intermediate Commercial Geography*, which was entitled "The Economic Geography of the Leading Countries," a detailed account was given of the regional geography of a number of the principal countries of the world, but only very brief comments on the others. It is inevitable that any such selection must be an arbitrary matter and not suitable for all purposes. The rapid exhaustion of the first edition of that book and the call for a second edition seemed to offer an opportunity for the publication of the work in Parts, and led to the preparation of the present series of books. As the change in title suggests, however, the present series is much more than a reprint in Parts of the *Intermediate Commercial Geography*. The account of those countries whose regional geography was treated at length in the latter work will be found reprinted in the present series almost without alteration, but there are numerous additions dealing with smaller countries. Thus the accounts, to take concrete examples, of Canada, the United States, the Union of South Africa, Australia, New Zealand, etc., are practically unchanged, but the sections on such areas as East Africa, Tropical West Africa, Central America, East and West Indies, Siberia, etc., are entirely new. In the *Intermediate Commercial Geography* the space which was devoted to the countries of Europe was of necessity much restricted, and in particular the account of the British Isles was only a brief summary. This was justified because of the extensive study of the British Isles which is usually part of a matriculation course; but in the present work the opportunity has been taken of giving a full treatment to Britain and most of the European countries. Part V, "Europe and the Mediterranean Lands," is therefore entirely a new volume. Further, the treatment throughout the present series, whilst paying due attention to economic aspects, does not lay unnecessary stress on that side of the regional geography.

Again, the present series is intended primarily for the first years of a University course or for the last years of a High School, Secondary School, or College course: that is, for the post-matriculation stage. In nearly all such courses varying degrees of specialization are now the rule, and the Parts of the present work have been so arranged that students will usually only require two

or perhaps three of the separate volumes. It is hoped that the series will cover the requirements of all the Intermediate courses in geography of the University of London, the corresponding courses for the Higher School Certificates of the Oxford and Cambridge Joint Board, Northern Universities Joint Board, the Central Welsh Board, and the University of London, together with all examinations of an equivalent standard in various parts of the world.

On previous occasions I have received the greatest assistance from correspondents pointing out errors or imperfections, and I should be very grateful to any one who will take the trouble to point out any improvements desirable in these volumes.

L. D. S.

London School of Economics,
March, 1930.

NOTE TO PART III

Australia and New Zealand

This part is, in the main, a reprint of the corresponding sections in *An Intermediate Commercial Geography*, with certain additions, and is based on the chapters on Australia and New Zealand in *The World, a General Geography for the Schools of Australia and New Zealand*, by L. Dudley Stamp and A. Grenfell Price (Longmans, 1928). In the latter work will be found a fuller treatment of a number of the topics considered.

L. D. S.

RECENT STATISTICS

During the printing of this volume the following statistics have become available and may be used for bringing the diagrams up to date.

Page 30, Fig. 34: Numbers of sheep in the world in 1928 (in thousands)—U.S.S.R., 123,810; Australia, 106,115; U.S.A., 47,171; Union of S. Africa, 42,500; Argentina, 36,209 (1924); British Isles, 27,856; New Zealand, 27,134; British India, 23,350; Spain, 20,067 (1925); Uruguay, 14,443 (1924).

Page 32, Fig. 35: World production of wool (in thousands of metric tons)—1926—1,365; 1927—1,582.

Page 32, Fig. 36: Production of wool on a "greasy" basis for 1927 (in millions of lbs.)—Australia, 924; New Zealand, 202; Argentina, 331; Uruguay, 130; U.S.A., 328; U.S.S.R., 237; Union of S. Africa, 240; United Kingdom, 118. For 1928–9—Australia, 950.

Page 42, Fig. 47: Exports of Australia, 1927–8—£138,600,000; 1928–9—£134,800,000.

Page 43, Fig. 49: Imports of Australia, 1927—£148,200,000; 1928–9—£145,500,000.

Page 85, Fig. 85: New Zealand. Number of sheep (in thousands): 1926—24,900; 1927—25,700; 1928—27,100; 1929—29,100. Production of wool (in thousands of lbs.): 1926—207,800; 1927—202,400. Export of frozen meat (in millions of cwt.): 1926—3·03; 1927—3·37; 1928—3·79; 1929—3·23.

The 1929 export comprised 328,400 cwt. of beef (£534,400), 1,851,000 cwt. of lamb (£6,786,000), 879,500 cwt. of mutton (£1,791,000) and 169,000 cwt. of pork (£544,000).

Page 88, Fig. 88: Exports of New Zealand (domestic), 1927—£47,600,000; 1928—£54,660,000; 1929—£54,200,000.

Page 88, Fig. 89: Exports of New Zealand, *per capita* value, 1928—£38; 1929—£36 15*s*.

Page 89, Fig. 91: Imports of New Zealand, 1927—£44,800,000; 1928—£44,900,000; 1929—£48,800,000.

Page 90, Fig. 92: Imports of New Zealand, *per capita* value, 1928—£31 4*s*.; 1929—£33 3*s*.

AUSTRALIA AND NEW ZEALAND

GENERAL CONSIDERATIONS

THE island-continent of Australia lies wholly in the Southern Hemisphere and is the only continent so situated. The general term "Australasia" is sometimes used to include Australia, New Zealand, and certain other important land masses, but is generally taken to exclude the multitude of small islands scattered over the surface of the Pacific Ocean. The somewhat older term, Oceania,

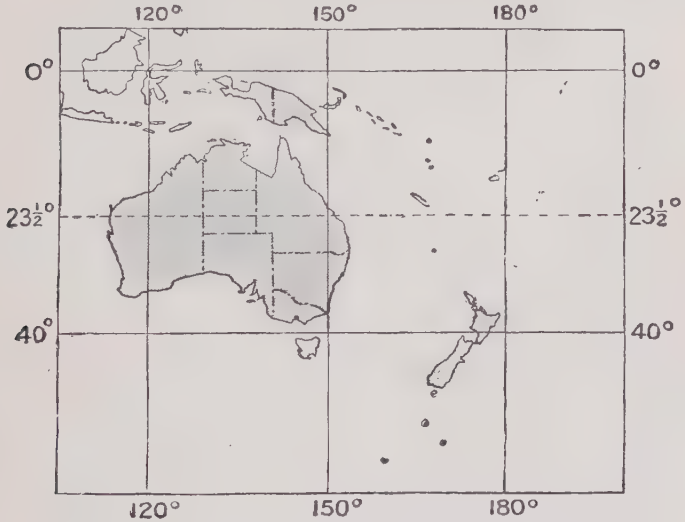

FIG. 1.—Australia and New Zealand. The position of important lines of latitude and longitude.

is inclusive of these islands, some of which, it should be noted, lie north of the equator. The principal land masses included under Oceania are therefore:

(*a*) Australia which, together with the large island of Tasmania and various small islands round the coasts, constitutes

the Commonwealth of Australia. Australia is the largest island in the world, excluding, of course, the continental masses of Antarctica, the Americas, and Eurasia-Africa.

(*b*) The two large islands, North Island and South Island which, together with Stewart Island and a number of small groups, constitute the Dominion of New Zealand.

(*c*) The large island of New Guinea or Papua.

(*d*) A very large number of small islands scattered over the Pacific Ocean, collectively known as Polynesia (eastern portion), and Melanesia (western portion).

(*e*) A number of islands lying north of Australia and forming part of the East Indies are usually considered as Asiatic islands, but sometimes as Australian.

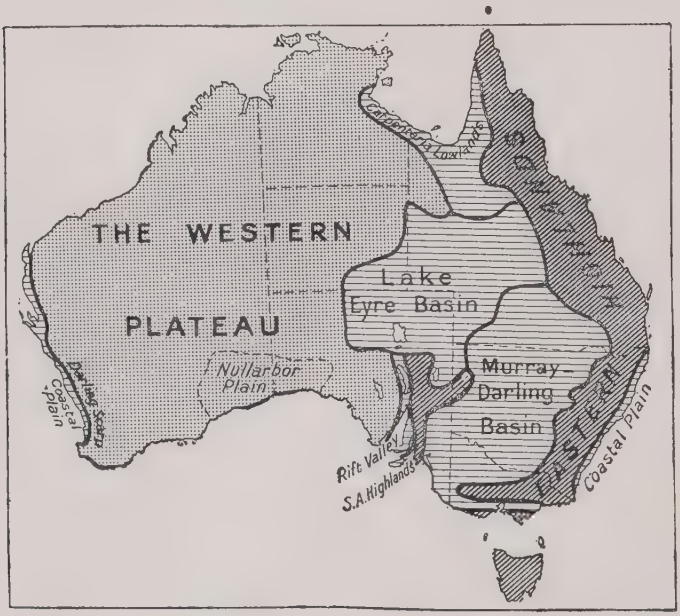

FIG. 2.—The main physical regions of Australia.

Except part of New Guinea and a number of the islands of the Pacific, and the East Indies, the whole of Oceania forms part of the British Empire.

Fig. 1 shows the important lines of latitude and longitude in Australia. The Tropic of Capricorn cuts right through the centre of Australia, so that rather less than half lies in the Tropics and rather more than half in the Temperate Zone. The important states of New South Wales, Victoria, Tasmania, and South Australia, as well as the greater part of Western Australia, lie within the Temperate Zone. The line of latitude of 40° S. passes between Tasmania and

the mainland of Australia and also through the North Island of New Zealand. This is important because the Mediterranean regions of the world lie mainly between latitudes 30° and 40°.

The area of the Australian Commonwealth is roughly 3,000,000 square miles or approximately the same as the United States excluding Alaska. New Zealand, with 104,000 square miles, is larger than Great Britain but smaller than the British Isles. The following table is for reference purposes:

	Area in square miles			Population	
	Whole	Tropics	Temperate	Census 1921	1925
Commonwealth	2,974,581	1,149,320	1,825,261	5,435,734	5,992,084
Queensland	670,500	359,000	311,500	755,972	861,185
N.S.W.	309,432	—	309,432	2,100,371	2,298,442
Victoria	87,884	—	87,884	1,531,280	1,684,017
S.A.	380,070	—	380,070	495,160	551,633
W.A.	975,920	364,000	611,920	332,732	372,183
Northern Terr.	523,620	426,320	97,300	3,867	3,656
Tasmania	26,215	—	26,215	213,780	217,032
Federal Capital Terr.	940	—	940	—	3,936
New Zealand	103,862	—	103,862	1,218,913	1,327,262
				White*	Native*
Papua	90,540	90,540	—	1,371	275,000
Br. New Guinea	91,000	91,000	—	1,450	325,000
Dutch New Guinea	160,692	160,692	—	487	195,460
Br. Solomon Isles	11,000	11,000	—	148	50,000
New Caledonia	8,548	8,548	—	57,208	
Fiji	7,083	7,083	—	3,878	153,388
Hawaii	6,449	6,449	—	255,912	
New Hebrides	5,700	5,700	—	1,000	60,000
W. Samoa	1,250	1,250	—	38,230	
French Poss. in Oceania	1,520	1,520	—	31,655	
Other Isles	2,666	—	—	—	
Total, Oceania	3,464,891				

* 1921.

AUSTRALIA

Physical Features.—Roughly three-quarters of the land mass of Australia lies between the 600 and 1500-feet contours. The continent may be divided simply into three units (Fig. 2):

(1) The Western Plateau.
(2) The Eastern Highlands.
(3) The Central Lowlands.

The Western Plateau occupies nearly two-thirds of the whole of Australia, and is almost entirely more than 600 feet above sea-level. It includes the whole of Western Australia, much of South Australia,

and most of the old Northern Territory. Along part of the west coast, as in the neighbourhood of Perth, there is a narrow coastal plain, but along the south the plateau reaches the coast itself and gives rise to cliffs. In the interior and along the south coast there are no rivers; the Trans-Continental Railway, which crosses the southern part of the plateau, runs for over a thousand miles without crossing a single permanent watercourse. In the tropical regions of the north are several rivers, such as the Fitzroy, Victoria, and Roper, which are navigable by launches or small steamers in their lower courses. In the south-west the Helena River has been dammed for water-supply purposes.

The Eastern Highlands vary greatly in character in their course from Cape York in the extreme north to the vicinity of Mount Gambier in the south. In general, however, they present a steep face to the seaward and have a long, gentle slope inland towards the Central Lowlands. Along much of the coast of Queensland the mountains reach the coast; farther south, in New South Wales, there is usually a narrow coastal plain. In Victoria the main ranges turn westwards, and parallel ranges are developed farther south. Tasmania is a mountainous island, forming a detached mass of the Eastern Highlands. In view of the steep eastern face, very important are the gaps which occur at intervals in the highlands, and they have played a leading part in the development of communications and coastal towns. The Cassilis Gate behind Newcastle, the Lake George Gap near Goulburn, and the Kilmore Gate behind Melbourne are specially noteworthy. Along the rocky east coast the land has subsided within recent times geologically and numerous drowned valleys afford excellent harbours, of which Port Jackson (Sydney Harbour) is the most famous. There are numbers of short rivers flowing eastwards into the Pacific Ocean, and some, although their mouths are obstructed by sandbars, are navigable some distance from the sea. The group known as the "North Coast Rivers," including the Clarence, Richmond, and Tweed, is the most important. Brisbane is a river port, on the Brisbane River.

The Central Lowlands lie between the Western Plateau and the landward slopes of the Eastern Highlands, into which they gradually merge. A number of more or less distinct units may be separated:

(*a*) The Murray-Darling Basin, which contains the only important river system in Australia. The Murray and its tributary the Murrumbidgee both rise amongst the highest mountains of Australia, which are snow-capped for a considerable period of the year. They are never dry, but the volume of water varies greatly from season to season. The Murray is normally navigable as high as Albury from July to January; on the Murrumbidgee the river traffic is mainly below Hay. The Darling,

though above its confluence with the Murray nearly twice as long as the main river, and the Lachlan depend entirely on rain falling on the western slopes of the Eastern Highlands. The Darling can be used for navigation only very intermittently. Normally the river flows between well-defined banks 30 to 40 feet high, but in times of flood has been known to form a spread of water as much as 60 miles broad. Before emptying into the sea the Murray enters into a group of shallow lakes—Alexandrina, Albert, and the Coorong—from which the waters reach the sea by a sand-blocked and shifting mouth, so shallow as to prevent access by ocean-going craft. Navigation on the Murray-Darling system has become less and less important as the importance of the water in irrigation has advanced.

The northern part of the Murray-Darling basin lies in the great artesian area of Queensland.

(*b*) The Lake Eyre Basin. This is an area of inland drainage, the few streams, which are all non-perennial, flowing into Lake Eyre. Lake Eyre itself has a stretch of salt water occupying its southern portion, but the remainder of the lake is usually a vast salty plain. The northern part of the basin also lies in the great artesian area.

(*c*) The lowlands round the Gulf of Carpentaria, forming the northern part of the artesian basin.

(*d*) The Rift Valley of South Australia is occupied by Spencer Gulf, Lake Torrens, and several small but important plains. The Rift Valley is separated from the Murray-Darling Basin by the South Australian Highlands.

Geology.—The three great physical divisions of Australia are determined essentially by geological structure.

The Western Plateau consists of a massif or stable continental block of ancient rocks—metamorphic schists, gneisses, and slates, with intrusions of igneous rocks, especially of granites, and more basic rocks commonly called greenstones. In the south the rocks are mainly pre-Cambrian, in the north are large areas of old Palæozoic sediments. The rocks over the whole plateau were intensely folded at an early date and were worn down into a plateau. For a very long time now in the earth's history it has formed a "stable block," resisting later folding. The area has not always been at its present elevation above sea-level. The south-east was covered by a gulf of the sea in Tertiary times, and the ancient rocks are there covered by a huge stretch of nearly horizontal limestone forming the Nullarbor Plains.

The Eastern Mountains consist mainly of folded rocks of the Palæozoic periods, pierced by masses of igneous rock, especially granite. Like the ancient rocks of the Western Plateau, these old rocks are, in many places, rich in minerals. The main folding

of the highlands took place before the Coal Measure period, and the coal measures lie mainly in basins amongst the older rocks.

The Central Lowlands consist for the most part of younger rocks. The *Murray-Darling Basin* is occupied partly by Tertiary sediments laid down in a former arm of the sea, and partly by later alluvium. The *Lake Eyre Basin* and the lowlands round the Gulf of Carpentaria occupy the site of a great gulf of the sea which existed in Cretaceous times. The sediments laid down in this gulf have since been slightly folded into a broad shallow syncline—the famous " Great Artesian

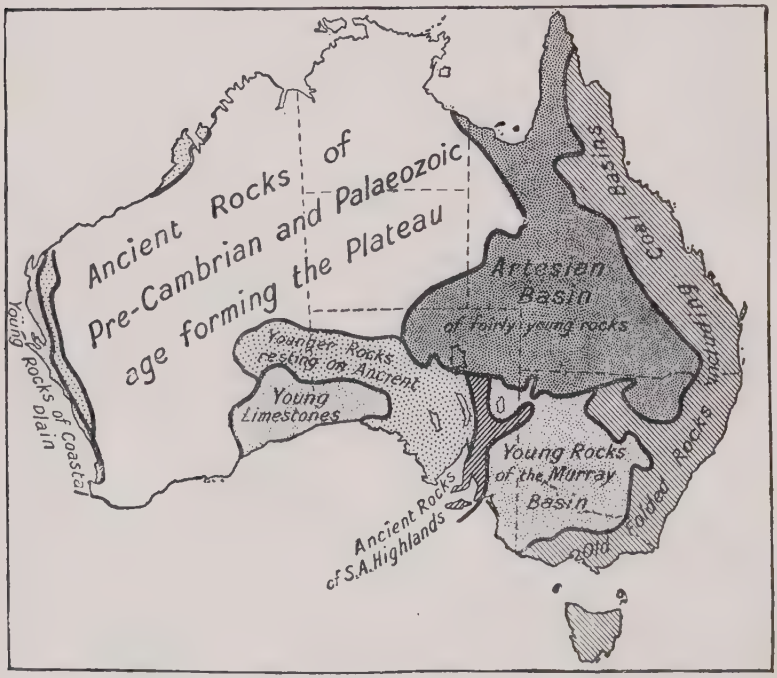
Ancient Rocks of Pre-Cambrian and Palaeozoic age forming the Plateau
Artesian Basin of fairly young rocks
Younger Rocks resting on Ancient
Young Limestones
Young Rocks of Coastal Plain
Young Rocks of the Murray Basin
Ancient Rocks of S.A. Highlands
Old folded rocks
Coal Basins

Fig. 3.—Simplified geological map of Australia.

Basin "—the largest of the artesian basins of Australia. The South Australian Highlands consist of ancient rocks which were crushed by earth movements against the ancient massif of the Western Plateau. The highlands consist of a number of plateau blocks with steep escarpments to the rift valley on the west, and more gentle slopes to the Murray Basin on the east.

Minerals.—It was the mineral riches of Australia—more particularly gold—which first attracted white colonists to the continent in large numbers, although the spread of the squatters had already settled wide areas. Although the value of the gold produced has declined steadily in recent years, that of coal has shown a steady

increase, and Australia is also an important producer of silver, lead, zinc, and copper.

Gold.—In the ten years which followed the discovery of gold in 1851, half a million people joined in the gold rushes to Australia. After the initial richness had been exhausted and many of the gold diggers had turned to the development of the land, a new impetus was given to gold mining by the discoveries at Coolgardie in Western Australia in 1891–2. A graph showing the gold production of Australia has been given in Fig. 4, below. The rapidly declining

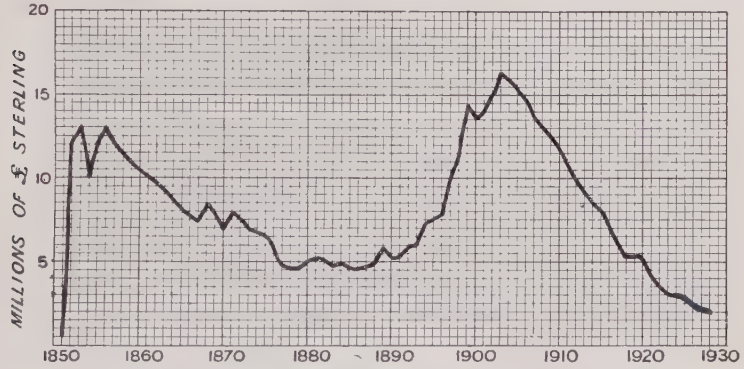

Fig. 4.—Graph showing the production of gold in Australia.

Contrast this with the diagram (Fig. 85) showing the production of wool in New Zealand—an example of steady agricultural development.

value of the gold won annually should be noted from the graph. Between 1851 and the end of 1924 gold to the value of £620,000,000 ($3,000,000,000) was obtained in Australia, but no less than a sixth of this was won in the first ten years.

Gold is widely distributed in Australia, being absent only from such areas of young sedimentary rocks as the Murray-Darling Basin and the Great Artesian Basin.

Gold is one of the most stable of metals and is usually found native in nature. Gold-bearing deposits fall into two broad classes:

(1) Reef or lode deposits, associated usually with igneous rocks. The gold-bearing rock (usually consisting mainly of quartz) is mined and has to be crushed before the gold can be extracted. In Australia association with copper is common, as in the great Charters Towers field of Queensland.

(2) Alluvial or placer deposits, which represent deposits laid down by streams emanating from gold-bearing country. The native gold has been washed out of the parent rock and, being very heavy, has become concentrated in "pay streaks" at or near the base of the sands or gravels. The gold occurs as dust or sometimes as "nuggets." Unless the gold-bearing alluvial deposits are very extensive, these superficial gold areas are very quickly worked out.

It was the richness of alluvial deposits which really gave rise to the gold rushes. The "deep alluvial leads" are really alluvial deposits of much earlier geological age buried deeply under newer rocks. The gold-bearing conglomerates of Western Australia may be compared, in some ways, with the banket of South Africa.

It must be noticed that many of the famous old mines now yield very little gold. The once famous Coolgardie is now almost forgotten, Kalgoorlie is a skeleton of its former self; in Victoria, Ballarat and Bendigo have very small outputs; the Charters Towers field of Queensland is apparently approaching exhaustion. For the world position of Australia, see Fig. 5. In 1928 the production had fallen to 469,100 ounces, worth £1,944,000.

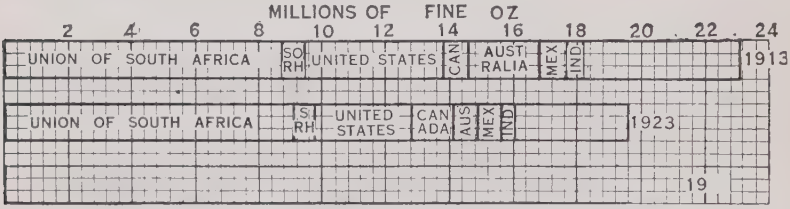

Fig. 5.—Production of gold in the principal producing countries.
So.Rh.=Southern Rhodesia; Can.=Canada; Mex.=Mexico; Ind.=British India.

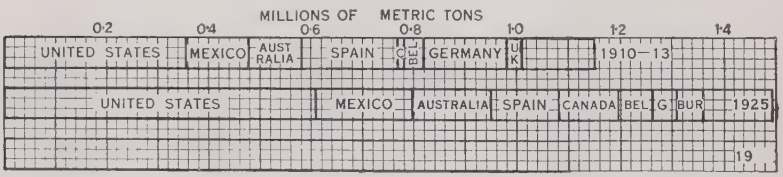

Fig. 6.—Production of lead in the principal producing countries.
C.=Canada; Bel.=Belgium; G.=Germany; Bur.=Burma.

Silver and Lead.—The annual value of the silver and lead now produced in Australia is greater than that of the gold. The ores of silver and lead tend to occur together, and by far the most important area is Broken Hill in New South Wales. Worked since 1883, it is probably the richest silver-lead area in the world, and has resulted in the rise of a town of 30,000 inhabitants in an arid tract which would otherwise be almost uninhabited. Nearly all the traffic to and from the mines passes through Port Pirie in South Australia, where huge smelting works have been built. The production in recent years has been about 9,000,000 oz. of silver and 150,000 tons of lead. Other silver-lead mines are Chillagoe and Mount Isa in Queensland; Mount Farrell, Mount Lyell, and Zeehan in Tasmania. See Fig. 6 for the world position of Australia.

Zinc.—The production of zinc is at present almost confined to the Broken Hill district. As the richer silver deposits become

exhausted more and more attention is being paid to zinc, and the value is equal to half that of the silver and lead combined.

Copper.—The production from the widely distributed copper-bearing deposits of Australia varies greatly from year to year according to world prices of copper. South Australia was once the leading state, with the Burra, Wallaroo, and Moonta mines as the chief centres, but labour costs and poorer ore have led to the abandonment of almost all the mines. Queenland is probably the richest state in reserves especially in the Cloncurry district, and yet has produced little metal in recent years except from Mt. Morgan. Tasmania's output is mainly from Mt. Lyell; in New South Wales there is a small quantity of copper in the silver-lead-zinc ores of Broken Hill, but the once famous copper mines of Cobar are now no longer worked. The marked fluctuations in production in recent years is shown in the following table:

	£
1919	1,891,875
1920	2,657,756
1921	803,957
1922	844,126
1923	1,245,836
1924	876,030
1925	775,043
1926	565,743

Tin.—The production of tin from the widely distributed tin ores of Tasmania, New South Wales, and Queensland fluctuated widely, as with copper—from over £1,000,000 in 1920, for example, to less than £400,000 in 1922. Much of the output is from alluvial deposits. In New South Wales tin-mining is centred in the New England States; in Queensland it is widely distributed.

Iron.—Iron ores are widely distributed in Australia, but in most cases the richest deposits are far removed from coal, and at present the smelting of the ore and the production of pig iron is almost entirely restricted to the coal field towns of New South Wales. The Lithgow ironworks depend on local supplies of ore, but the larger ironworks at Newcastle use ore from the immense deposits at Iron Knob, South Australia. Iron Knob is a hill about 40 miles west-south-west of Port Augusta and is almost a solid mass of good quality iron ore. The quarries are connected by a private railway with the sea-board at Whyalla, 34 miles away. From thence the ore is carried by sea to Newcastle, the limestone necessary as a flux being obtained from Devonport—again near the coast—in Tasmania. Despite the Government bounty on fencing and rabbit wire, galvanized sheets, and traction engines, the Australian production of iron and steel is still well below a million tons annually. The Australian product finds it difficult to compete with the cheap iron and steel of the United States and Europe. This is partly due to the fact that the industry is very young, but much of the slow

progress is also the result of the high cost of labour, short hours of work, and the great distances separating the deposits of coal and iron.

Coal.—The total value of the coal raised to date is only about a quarter of that of the gold, but the annual value of coal is now roughly equal to that of all other minerals put together. The annual value (1921–26) is roughly £10,000,000.

The most important coal fields lie in basins amongst the older rocks of the Eastern Highlands, especially in New South Wales (Fig. 7).

(1) The New South Wales Basin is the largest coal field in the Southern Hemisphere. In almost the geometrical centre

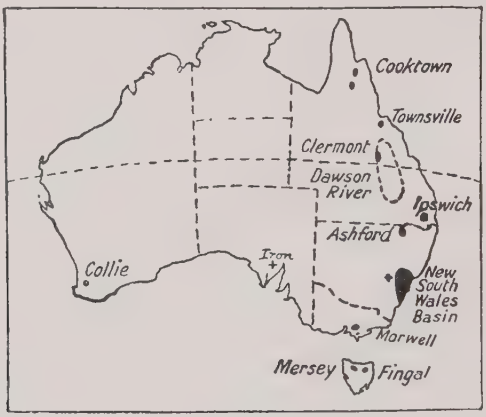

Fig. 7.—The coal fields and principal iron fields of Australia.

of the basin lies Sydney, but the coal is at present worked mainly at or near the outcrops in :

(*a*) The Northern or Newcastle Field.
(*b*) The Western or Lithgow Field.
(*c*) The Southern or Illawarra Field.

The lower or Greta seams are now extensively worked between West Maitland and Cessnock in the northern area, which is the premier coal-producing region of Australia. Reserves of good coal in the New South Wales Basin alone are known to be at least 20,000 million tons—equivalent to about 15 years' world supply at the present rate of world production. Probable reserves are five times this quantity.

(2) The Dawson River Basin in Queensland is a huge undeveloped field with excellent coal. Coal is worked farther north at Clermont.

(3) Small fields with excellent coal occur at Ashford in New South Wales; in the Mersey River area in Tasmania; near Townsville and near Cooktown (two) in Queensland. The small Collie coal field of Western Australia has a poorer quality.

All the above coal fields are of Permo-Carboniferous age. In addition Australia has a number of fields with coal of a later age. The Triassic and Jurassic coals may be almost as good as the older Permo-Carboniferous coals, but the Tertiary basins yield only brown coals or lignites.

(1) The Ipswich Field, in Southern Queensland, furnishes coal which is excellent for the manufacture of coke. The field is a large one and extends into New South Wales (Clarence and Richmond River Fields), but the coal there is good enough for local use only.

(2) The Fingal Field, Tasmania, furnishes coal similar to that of Ipswich.

(3) The brown coal reserves of Victoria are estimated to exceed 10,000 million tons. The Morwell deposits have been opened up by an open mine at Yalbourn and electricity is being generated to supply Melbourne and a large area. A plant has also been installed to produce 100,000 tons of briquettes a year.

Other Minerals.—In recent years much attention has been given to the search for mineral oil in Australia. On the whole the geological structure of the continent is unfavourable and results have been disappointing. Extensive deposits of oil shale are known in Tasmania and New South Wales, and may later become of commercial importance. Large quantities of salt are obtained from shallow lakes in South Australia, chiefly in Yorke Peninsula, and from lakes in Northern Victoria as well as by the evaporation of sea-water in South Australia, Victoria, and Western Australia. Among gemstones, the Lightning Ridge Field of New South Wales, the Opalton area of Queensland, and the Stuart's Range Field of South Australia are all famous for their fine opals. Sapphires, a few diamonds, arsenic, antimony, cobalt, gypsum, molybdenite, osmiridium, and platinum are also obtained in Australia.

Climates.—The climatic conditions of Australia are controlled by certain dominant factors:

(1) *Latitude.*—The Tropic of Capricorn passes right through the continent, the latitude of 40° S. lies between Australia and Tasmania. In December, in the southern summer, the sun is thus shining vertically over Australia, and the whole continent (excepting Tasmania) lies in the Trade Wind Belt, and the prevailing winds are from the east (South-East Trades). Owing

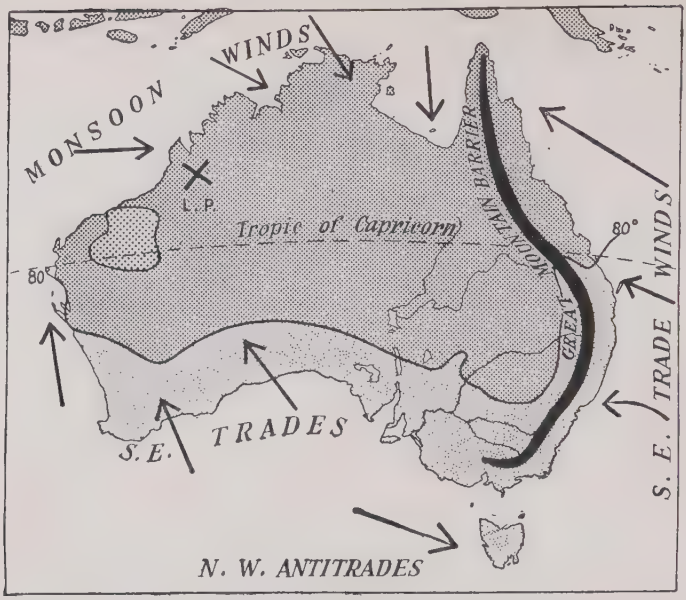

FIG. 8.—Climatic conditions in the hot season (November to April).

Notice the low pressure centre (L.P.) in the north caused by the great heat, and notice the monsoon winds which it causes. The isotherms are those for January.

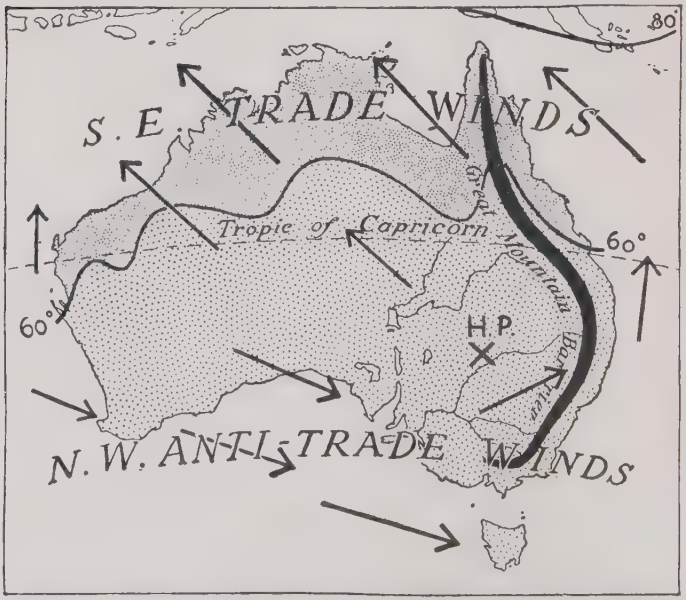

FIG. 9.—Climatic conditions in the cold season (May to October).

Notice how the main wind systems have moved northward and that the southern coast comes under the influence of the Anti-Trade Winds. The isotherms are those for July.

to the great heat over the heart of the continent a monsoonal effect is developed over the north-west. In the southern winter, Northern and Eastern Australia lie still in the Trade Wind Belt, but the southern coasts come under the influence of the Westerlies (North-West Anti-Trades).

(2) *Configuration.*—At all seasons the Eastern Highlands form an effective barrier to the penetration of the Trade Winds, and the fact that the western half of Australia is an elevated plateau prevents the effective penetration of the monsoons along the north-west coast in summer and the westerlies along the south in winter. It follows that only the margins of the continent have an adequate rainfall; the interior is everywhere arid.

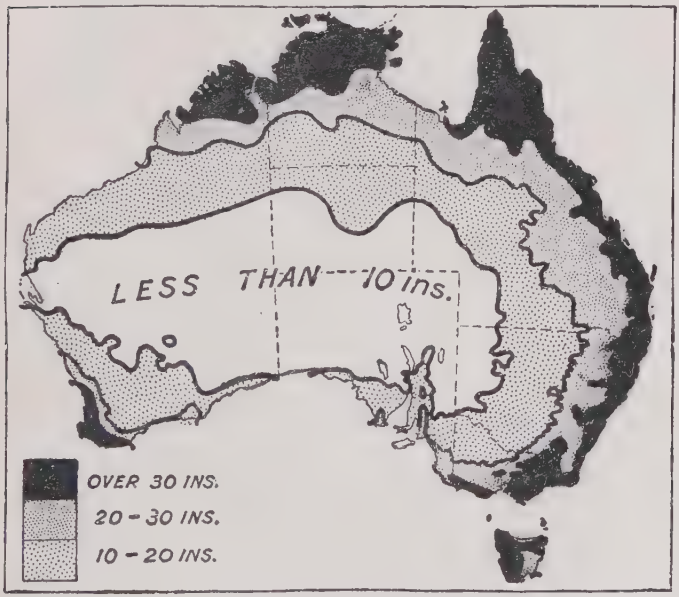

Fig. 10.—A simplified rainfall map of Australia.

Figs. 8 and 9 illustrate temperature and wind conditions in January (summer) and July (winter). Fig. 10 is a simplified rainfall map of Australia. Certain of the same rainfall lines are repeated on Fig. 11, which also indicates the seasonal distribution of rainfall. In the dry heart of Australia the rainfall is not only very meagre but also very unreliable. This is illustrated in Fig. 12.

During the winter the greater part of Australia, south of the Tropics, is subject to ground frosts. A frost map (Fig. 13) has been included because of the importance of frost in agriculture, but Australia does not suffer in the same degree as South Africa from

harmful late spring frosts (October and November) or equally harmful early autumn ones (March and April).

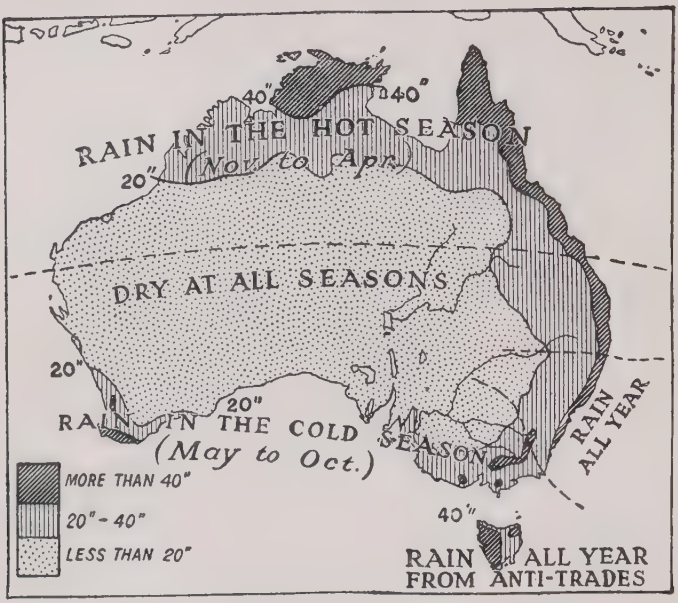

Fig. 11.—The seasonal distribution of rain in Australia.

In the Tropics 20 inches of rainfall may be regarded as roughly a minimum for agricultural development; in the Temperate regions 10 inches is sufficient.

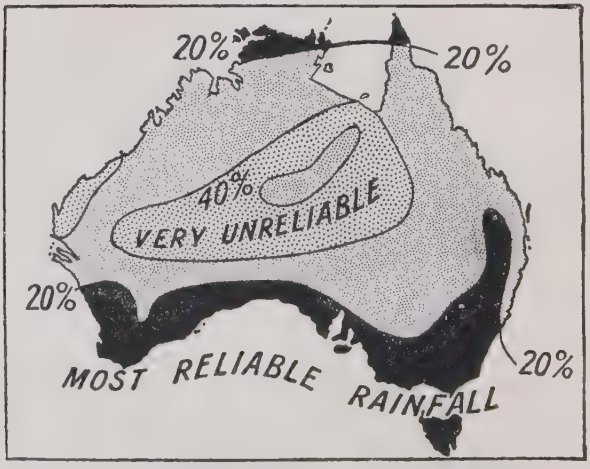

Fig. 12.—Rainfall reliability (*after Prof. Griffith Taylor*).

Climatic Regions.—Fig. 14 shows a division of Australia into climatic regions.

The Tropical Climate (Sudan Type, or climate of the Tropical Grasslands or Savanas) is found over a broad belt across the north

FIG. 13.—Frost map of Australia.

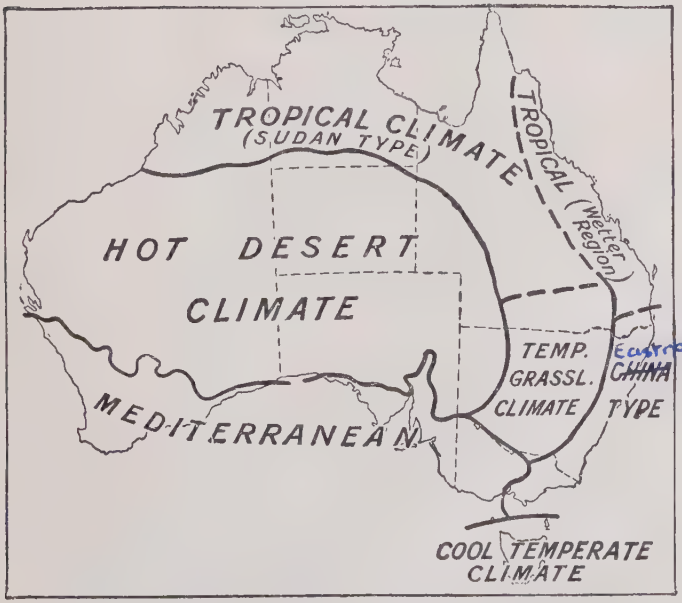

FIG. 14.—The climatic regions of Australia.

of Australia. It is a summer rainfall climate (see Figs. 15 and 16), and, as we have seen, much of the rainfall in the north-west is due to a monsoon, so that in the north-west the climate may be described as monsoonal, like that of India. The wettest regions are along the north coast and the east coast of Queensland (where the rainfall

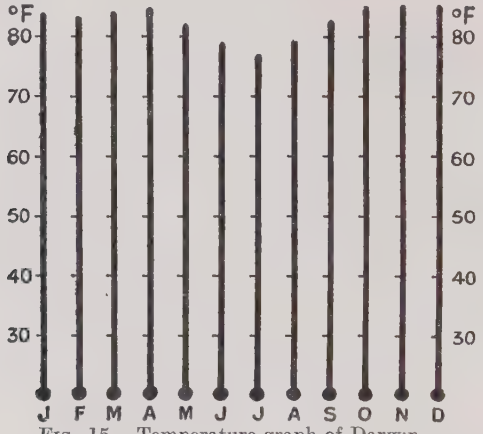

Fig. 15.—Temperature graph of Darwin.

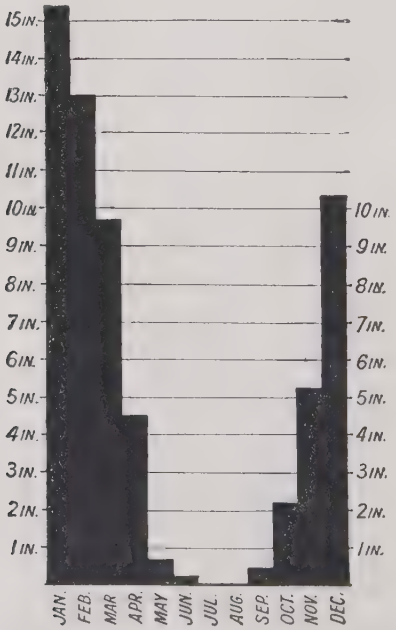

Fig. 16.—Rainfall graph of Darwin, typical of the wetter parts of the summer rainfall regions.

Notice the remarkable contrast between the very wet summer and very dry winter.

is brought by the Trade Winds), and there there is sufficient rain to support the growth of forests, but further inland is the typical savanaland.

The Hot Desert Climate is found over a large area in the heart of Australia. Notice that Australia lies in exactly the same latitudes

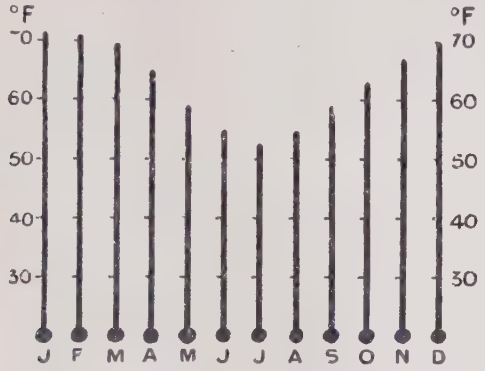

Fig. 17.—Temperature graph of Sydney.

as the great deserts of the world, such as the Sahara, Arabia, Atacama and Kalahari.

The Warm Temperate Oceanic Climate is found along part of the east coast—roughly the eastern part of New South Wales (Fig. 14). This type of climate has been called the Eastralian type. The land mass of Australia is small when compared with

Fig. 18.—Rainfall graph of Sydney.

Typical of east-coast regions with a well-distributed rainfall from the Trade Winds. Sydney, it will be noted, has an autumn maximum.

that of Asia, and eastern Australia does not suffer from the icy winds which blow across China from the interior in the winter months. Although even in Australia, as winter visitors to Katoomba know very well, bitterly cold winds from the west do sweep across the flat tops of the Blue Mountains, the Eastralian winter is comparatively mild. Sydney has a far more equable climate than Shanghai, which is roughly in the same latitude in

the Northern Hemisphere. Snow, which is usual in Shanghai in the winter months, does not fall on the coastal lowlands of New South Wales. Thus the " China Type " of climate with its summer monsoon rainfall and its bitterly cold winters does not occur in the Southern Hemisphere. Its place is taken by the Eastralian type with a well distributed rainfall brought by the Trade Winds and comparatively mild winters.

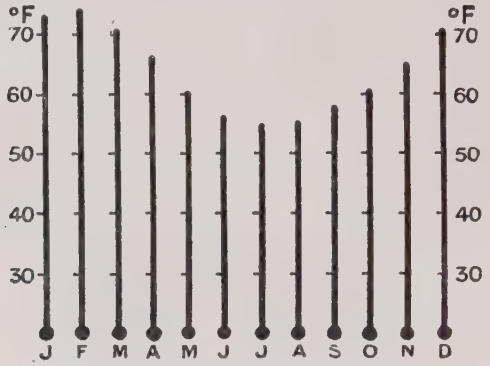

Fig. 19.—Temperature graph of Perth.

The Mediterranean Climate occurs in roughly the same latitudes as the last type, but on the western sides of the continents. So in Australia it is found in the south-west of Western Australia (Fig. 14), part of Southern Australia and the western part of Victoria. The eastern part of Victoria really receives too much rain in the summer months to be considered a typical Mediterranean

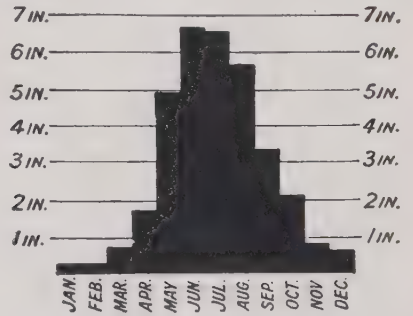

Fig. 20.—Rainfall graph of Perth.
Typical of the Mediterranean or winter rainfall regions.

climatic area; it may be considered intermediate in character between the Mediterranean, the Warm Temperate and the Cool Temperate.

The Temperate Continental or Temperate Grassland Climate occurs in the same latitudes as the Mediterranean and Temperate

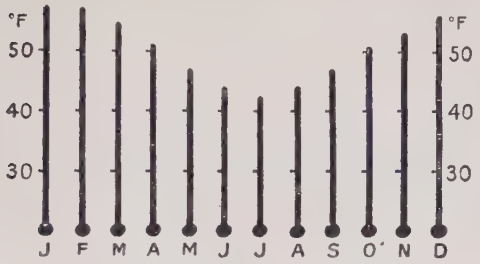

FIG. 21.—Temperature graph of Hobart.

Oceanic Climate, but towards the interior of the continent. Owing to the small size of the land mass no part of Australia is far removed from the influence of the sea, and so no part experiences the extremes

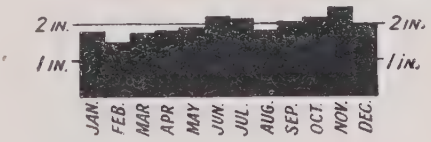

FIG. 22.—Rainfall graph of Hobart.

Typical of the drier eastern part of Tasmania, with a rainfall from the Anti-Trade Winds distributed throughout the year.

found in the heart of North America or of Eurasia. Winnipeg (Canada) has a range of temperature between summer and winter of over 60°; at Bourke, in the grassland region of Australia which

FIG. 23.—The more favourable climate regions—Monsoon climate, Warm Temperate Oceanic (China and Gulf types), Mediterranean Climate, Cool Temperate Oceanic, St. Lawrence type, and Temperate Continental Climate.

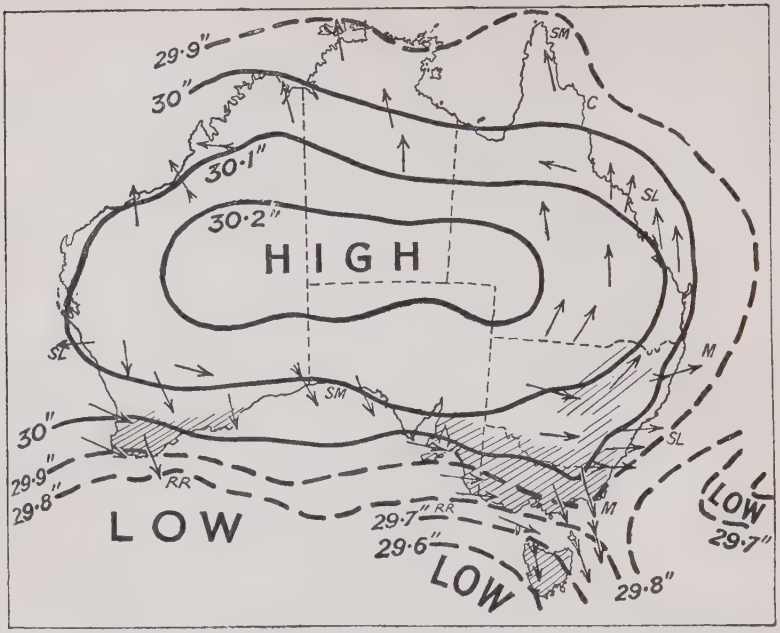

FIG. 24.—Weather chart showing typical winter conditions. Rain has fallen during the last 24 hours in the lined areas.

TYPICAL AUSTRALIAN AND NEW ZEALAND CLIMATES—TEMPERATURES (° F.)

Station	Height	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Range
Darwin . .	97	84	83	84	84	82	79	77	79	83	85	86	85	9
Perth . .	197	73	74	71	66	60	56	55	56	58	61	65	71	19
Brisbane .	137	77	76	74	70	64	60	58	61	65	70	73	76	19
[Shanghai .	33	38	39	46	56	65	73	80	80	73	63	52	42	42]
Alice Springs	2,000	84	82	76	67	59	54	52	58	66	73	79	82	32
Hobart . .	160	62	62	59	55	51	47	46	48	51	54	57	60	16
Dunedin . .	500	58	57	55	51	47	44	42	44	47	51	53	56	15
[London . .	18	39	40	43	47	53	59	63	62	57	49	44	39	24]
Bourke . .	460	84	83	77	68	58	54	51	56	63	70	76	82	33
[Winnipeg .	1,492	−3	−1	15	39	51	62	66	63	54	41	24	7	69]

TYPICAL AUSTRALIAN AND NEW ZEALAND CLIMATES—RAINFALL (INCHES)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Darwin .	15·3	13·0	9·7	4·5	0·7	0·2	0·1	0·1	0·5	2·1	5·2	10·3	61·7
Perth . .	0·3	0·3	0·7	1·7	4·9	6·6	6·4	5·6	3·3	2·1	0·8	0·6	33·3
Brisbane .	6·7	6·7	6·1	3·7	3·0	2·6	2·3	2·4	2·1	2·7	3·7	5·1	47·0
[Shanghai	2·2	2·3	3·4	3·8	3·7	6·5	5·5	5·9	4·7	3·2	1·7	1·2	44·0]
Alice Springs .	1·8	1·7	1·3	0·9	0·6	0·6	0·4	0·4	0·4	0·7	0·9	1·3	11·1
Hobart .	1·8	1·5	1·6	1·8	1·9	2·2	2·1	1·8	2·1	2·2	2·5	1·9	23·6
Dunedin .	3·2	2·3	2·6	2·7	3·4	3·0	2·9	3·5	2·4	2·4	2·9	3·3	34·6
[London .	1·8	1·7	1·7	1·7	1·8	2·3	2·6	2·4	2·0	2·7	2·3	2·1	25·1]
Bourke .	2·0	1·9	1·6	1·4	1·1	1·0	0·9	0·9	1·0	1·1	1·3	1·1	15·2
[Winnipeg.	0·9	0·8	1·3	1·6	2·2	3·3	3·2	2·2	1·9	1·4	1·0	0·9	20·9]

agrees roughly with the lower part of the Murray-Darling Basin, the range does not generally exceed 33°. The well-known Riverina of Australia lies in this climatic region, and so the climate is sometimes known as the Riverina type.

The Cool Temperate Climate, which is similar to that of the British Isles and North-Western Europe generally, occurs in

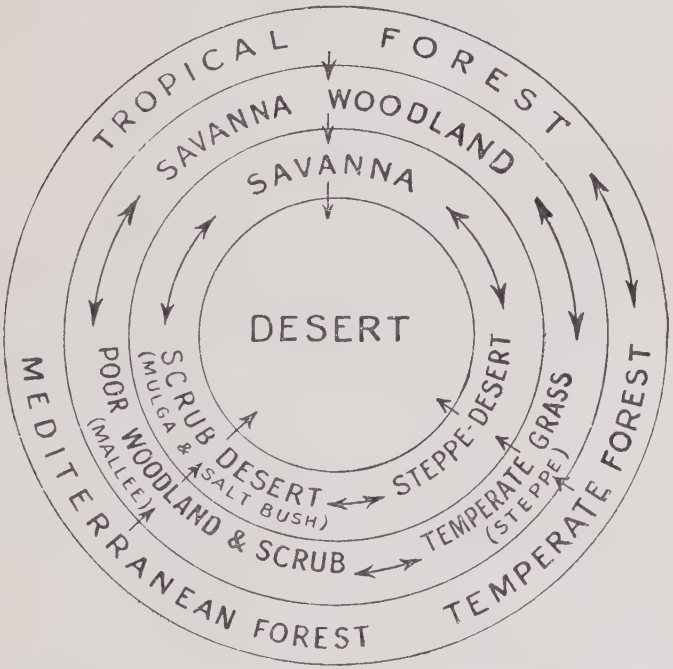

FIG. 25.—A diagrammatic scheme to explain the distribution of vegetation in Australia.

(Note: Savanna is more correctly spelt savana unless the form savannah is used.)

Tasmania (Fig. 14) and New Zealand. A somewhat warmer type occurs in eastern Victoria. Tasmania lies in the path of the westerly winds, and so the west of the island is wetter than the east. We find that the same is true of New Zealand and the British Isles.

Natural Vegetation.—The natural vegetation or "bush" of

Australia does not exhibit the variations which one might expect from the great differences in climate. There is not, for example, the contrast one would look for between the forests of Queensland, Victoria, and Western Australia. This is owing to the fact that Australia was cut off from Asia at an early date, and has a fauna and flora highly peculiar to itself. The most characteristic trees are the various eucalypts or gum-trees. Most of them have a somewhat sparse, grey-green foliage, evergreen but with the edges of the leaves turned towards the sky. Other characteristic plants are the acacias, and the salt-bush and blue-bush of arid tracts. Bearing in mind the sameness in the scenery due to the wide distribution of the eucalypts,

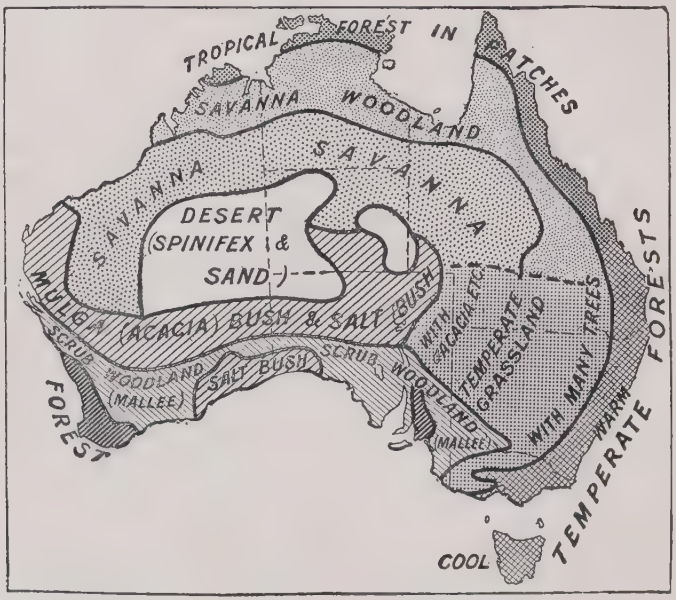

Fig. 26.—The natural vegetation of Australia.

each type of climate has its characteristic vegetation. Fig. 25 illustrates the mutual relationships of the vegetation, Fig. 26 its actual distribution. Figs. 26 and 14 should be studied side by side.

With a *Tropical Climate* the patches of tropical forest in the wettest parts give place to savana-woodland and then to typical savana. With a *Mediterranean Climate* the forest of the wettest parts gives place to a scrub woodland in which mallee (a small eucalypt) is the principal bush, and then to a scrub of mulga (an acacia) and salt bush. The typical vegetation of the *Eastralian Climate* is a eucalypt forest; inland this passes gradually through

a grassy forest to savana-like grasslands and then into the temperate grasslands of the Murray-Darling basin, with a *Temperate Grassland Climate*. The Cool Temperate Forests of Tasmania are in part eucalypt forests like those of the mainland, but large tracts of beech forest also exist and render a closer comparison with Europe possible.

Forests and Forestry. — Australia as a whole cannot be described as a continent rich in natural forests. Forests of good timber trees occupy less than one-sixtieth part of the Commonwealth —the official estimate being 1·29 per cent. The natural forests occur in five main areas :

(1) Blue Gum and other Eucalypt Forests occupy the crests and coastal slopes of the mountains of New South Wales and Victoria, including the Gippsland and Otway Hills.

(2) Tropical Forests occur irregularly down the eastern coast of Queensland and in the extreme north of Northern Australia. Unlike most of the forests of Australia some of the trees yield soft timber.

(3) Stringybark and Blue Gum Forests occur on the ranges of the South Australian Highlands.

(4) Fine karri forests (about 1,000,000 acres) as well as jarrah forests (about 8,000,000 acres) occur in the south-west of Western Australia.

(5) Important forests cover a large area in Tasmania.

Besides timber, the Australian forests yield large quantities of firewood, eucalyptus oil (obtained from the leaves), and barks used in tanning. Good tan bark is yielded by the golden and black wattles, but the greatest quantity is now obtained from plantations of Australian wattles in South Africa. In the years following the Great War the total value of forest produce approached £10,000,000 a year, a figure it now exceeds. Australia exports hard timber— which has a good reputation in South Africa, Great Britain, New Zealand, etc., for railway sleepers, wood-paving, and furniture— to the value of over a million pounds a year, but imports soft timbers for building to the value of four times that amount. The bulk of the softwood timber is now imported from the United States, Canada, New Zealand, Scandinavia, and Japan ; but both in Australia and New Zealand large areas are being planted with *Pinus radiata* and other softwood trees.

The danger of introducing wild or semi-wild plants into a country where they are free from hereditary enemies has been seen in Australia in the case of the Prickly Pear, which is proving a serious pest and has rendered useless thousands of acres in Queensland and New South Wales. In the animal kingdom the same thing is seen in the case of rabbits, introduced by early settlers, which have multiplied at an enormous rate. They eat every vestige of green

stuff from large tracts of land and so render vast areas unfit for sheep, and huge sums of money have been spent, often largely in vain, on rabbit-proof fences to prevent their spread.

Agriculture.—Primary production from agriculture, pasturing, dairying, mining, and forestry is the mainstay of Australian prosperity. In 1924–25 primary products were valued at £311,000,000, manufactures at £138,000,000.

Wheat.—Wheat is by far the most important crop in Australia. It occupies an area of nearly 10 million acres (1920–26 average) or nearly two-thirds of the total land under crops on the continent.

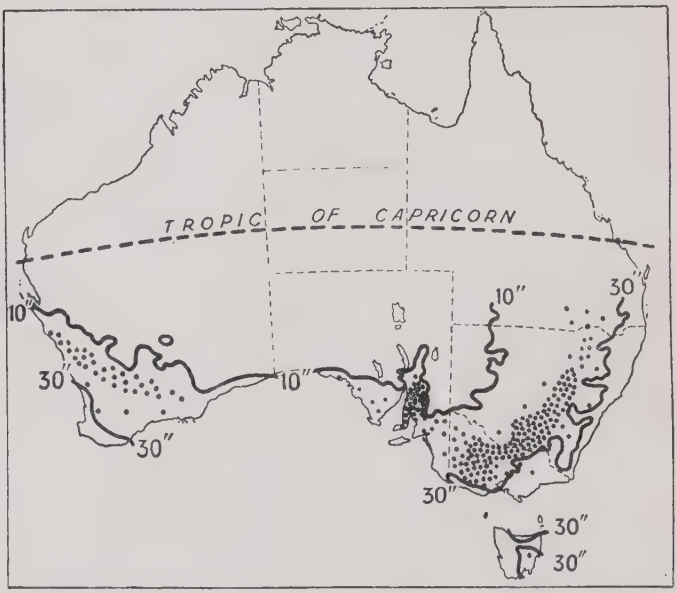

Fig. 27.—The distribution of wheat in Australia.

Each dot represents a yield of 500,000 bushels on an average in the years 1920–1926. Notice that all the wheat is grown south of the Tropic of Capricorn, and nearly all where the rainfall is between 10 and 30 inches—it is grown especially between 20 and 30 inches.

Even then, this area is less than 0·5 per cent. of the area of the continent. The Wheat Belt of Australia lies entirely outside the Tropics and almost entirely between the isohyets of 10 inches and 30 inches (Fig. 27). It will be noticed that the Wheat Belt lies mainly in the areas of Mediterranean and Temperate Grassland Climate. Farming practice differs considerably from that of other lands. In the spring-time—July and August—the ploughing for the next year's crop takes place. The ploughing is deeper in the lighter soils, but may be only 3 or 4 inches in heavy clays. The surface is then harrowed and raked over with a scarifier or cultivator.

The fine surface layer so formed prevents loss of water from the lower layers of the soil, and renewed harrowing after each shower prevents the hardening of the surface. The preservation of this powdery surface layer is the basis of the Australian " Dry Farming " system. Sheep are often turned out on the fallow to keep it clear of weeds and to enrich the soil by their manure—hence mixed sheep and wheat farming. The seeds are sown by drill in the autumn—about April, after the first autumn rains—the sowing being preceded by harrowing. Rains may be expected during June, July, and August, but the critical period when rain is essential is October and early November. Fig. 28 shows the close connection between winter rainfall and total yield. The earliest varieties of wheat are ready for harvesting in December. Owing to the dryness and firmness of the wheat stalk, combined with shortage of labour, Australia

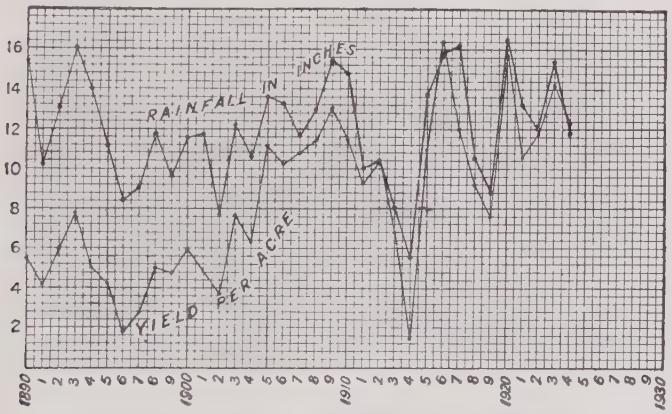

FIG. 28.—Graph showing the close connection between winter rainfall (April to November) and yield of wheat. This graph also illustrates the steadily improving yield.

The graph is based on the figures for the wheat-growing lands of South Australia. (*After A. G. Price.*)

evolved as early as 1843 the machine known as the stripper. This machine America and Australia have improved into the harvester, which not only cuts the wheat but threshes it and puts the grain into bags. The only operation left is the sewing up of the bags. The area under wheat in Australia grew steadily up to 1915–16, when a special war-time effort led to the cultivation of 12½ million acres and a production of 179 million bushels. Bad seasons and post-war conditions resulted in a serious decline, so that in 1919–20 the acreage fell to less than 6½ million acres, producing only 49 million bushels. Since then there has been a steady recovery, and the normal acreage may be regarded as over 10 millions and the crop over 150 million bushels (4 million metric tons). New South

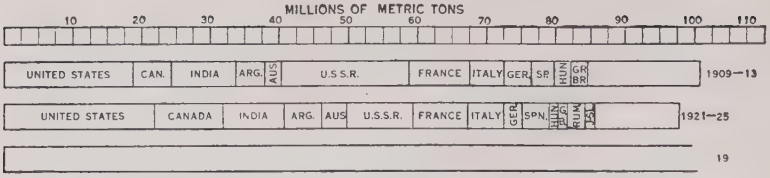

FIG. 29.—Production of wheat in the principal wheat-growing countries.

Notice the increase in the production of the United States, Canada, and Australia, and the drop in the Russian production. The 1909–13 figures related to the *same areas* of those of 1921–25. Thus the figures for U.S.S.R. are strictly comparable.

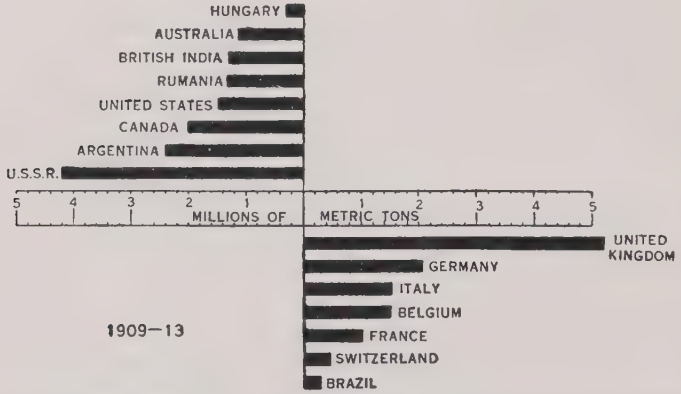

FIG. 30.—Wheat trade of the world, 1909–13—principal exporting countries (above) and principal importing countries (below).

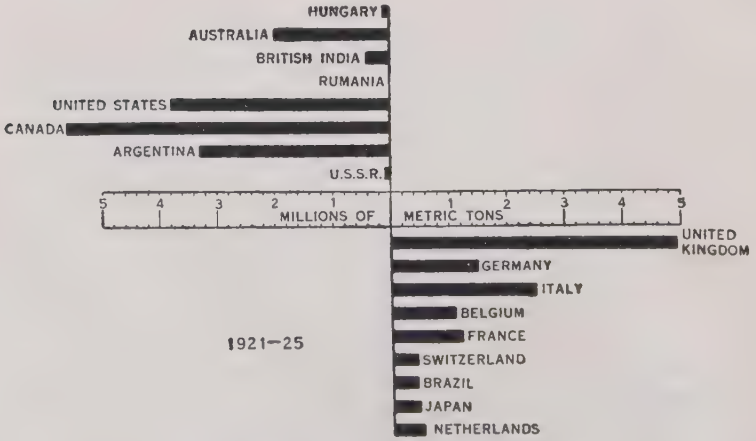

FIG. 31.—Wheat trade of the world, 1921–25.

Notice the extraordinary changes in the principal exporting countries and the increasing importance of Australia.

Wales (32–38 per cent.) leads in acreage and total yield; Victoria and South Australia are close rivals for second place whilst production in Western Australia is rising steadily. In the existing Wheat Belts there is ample room for extension of cultivation. Even in the best years only about a fifth or a sixth of the available land is in use. There is still ample room for improvement in the common yield of 12 or 13 bushels per acre (Canada, 20). Despite her huge production Australia only grows about 4 per cent. of the world's total. But nearly half Australia's crop is available for export, and Australia ranks fourth as an exporter (see Figs. 30–31). Australian wheat has a high reputation for its whiteness, and often commands the highest prices in the world's markets. Half the export goes to the United Kingdom, much of the remainder to the countries of North-Western Europe and Italy, but Japan is also a good customer.

Oats.—Oats come next in order of importance amongst the cereal crops of Australia, but cover only a little more than one-tenth of the area devoted to wheat. As usual, they grow in damper and cooler regions than those favouring wheat and half the crop is grown in Victoria. Apart from a small proportion (10–15 per cent.) consumed in making oatmeal, oats are used as fodder.

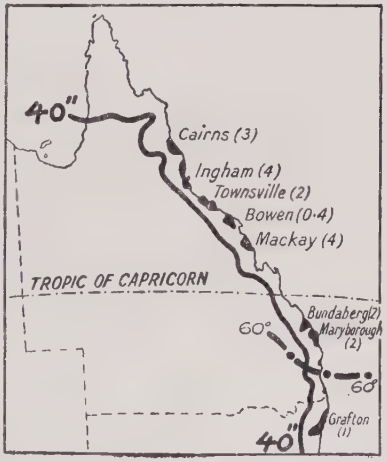

FIG. 32.—The distribution of sugar cane in Australia.

Notice that all the sugar cane is grown where the rainfall is more than 40 inches per year, and nearly all where the temperature is above 60° for the three winter months. The figures show number of acres (in 10,000) on an average for the years 1920–24. (*In part after James and Easterby.*)

Barley.—Despite wide fluctuations, the area devoted to barley has shown a marked tendency to increase steadily in recent years. The bulk is malting barley for the local brewing industry. The surplus, if any, goes mainly to Great Britain.

Maize.—Maize is grown for grain in Queensland and New South Wales, but mainly for fodder in the other states. It is curious that, with climatic regions eminently suitable, Australia does not grow enough of this cereal to satisfy her own requirements, and imports an additional quantity from South Africa. An increase in production may be expected when the value of the crop in fattening stock becomes generally appreciated.

Hay.—Next to wheat, hay covers the largest area of any crop—nearly a fifth of all the cultivated land. A large proportion consists,

not of the meadow grasses of other lands, but of wheat, oats, and lucerne. The dairying industry depends largely on hay and green fodder, and much lucerne is grown for sheep. Ensilage is little used.

Potatoes and other root crops are grown especially in Victoria.

Sugar.—The sugar cane flourishes in the warm coastal strip of Queensland (see Fig. 32). Despite the difficulties of cultivation

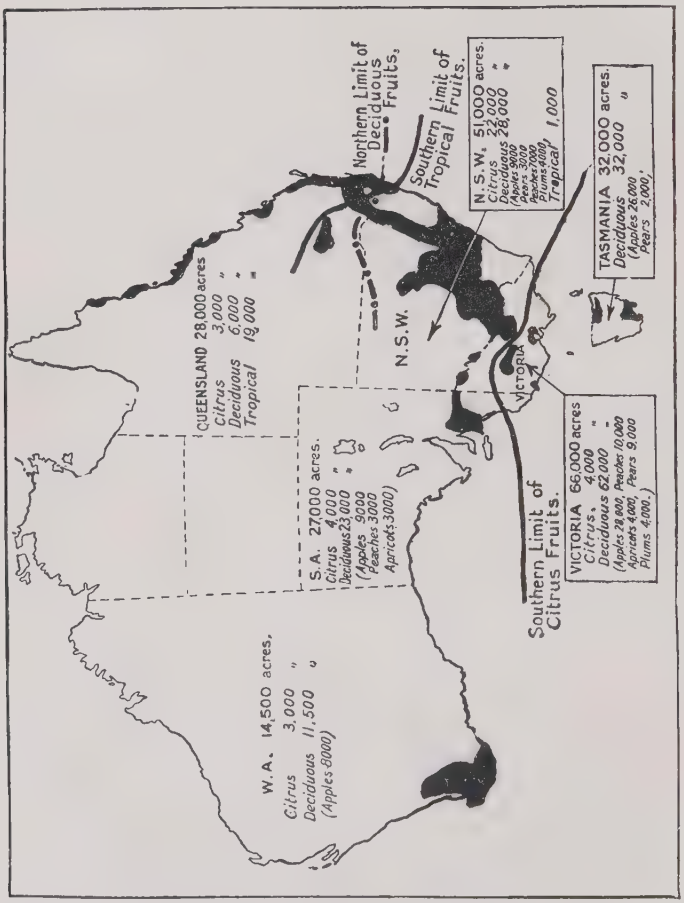

Fig. 33.—The distribution of fruit in Australia, 1924–25.
The majority of fruit orchards are within the areas marked in black, but are irregularly distributed.

by white labour under the White Australia Policy, Australia produces just sufficient to supply her needs.

Fruits.—The fruit-growing industry of the Commonwealth is now a very important one, and is increasing rapidly. Fig. 33 shows that all four principal classes of fruit are grown. Owing to the fact that the seasons are reversed when compared with Europe, Australia shares with South Africa the advantage of

being able to supply fruit to the European markets when it is scarce in the Northern Hemisphere. Study carefully the distribution of fruits shown on Fig. 33. For deciduous fruits Victoria and Tasmania are pre-eminently the fruit-growing states. The export from Australia of fresh apples alone is valued at nearly a million pounds sterling. Dried nectarines and peaches are also particularly important. Vineyards (114,000 acres in 1926-27) are specially important on the sunny slopes of the South Australian Highlands (50,000 acres) and on the irrigated lands of the Murray Basin. Wine-making, drying of rasins and currants are all noteworthy, and Australian products are making a bid for the European markets, especially in Great Britain. The principal Australian fruits figuring as exports are apples and oranges, raisins, dried peaches, and apricots.

Minor Crops.—Parts of Queensland are climatically suitable for cotton. The principal difficulty is the labour supply.

Live Stock.—Sheep.—Of all the animal fibres used in the textile industries the most important is the wool of the domestic sheep. There is no wild sheep with a fine fleece and the sheep was domesticated at an early date in the civilization of man. Sheep are now the most numerous of all domestic animals.

The fibres of wool differ from those of cotton in being covered with tiny overlapping scales. The presence of these scales accounts for the "felting" properties of wool; the fibres can be beaten together into a fabric (felt) without weaving. The fibres of wool are finely curled or crimped and a woollen cloth therefore includes a large proportion of air space. Air is a bad conductor of heat, and thus woollen clothes with their large amount of included air are very warm. Woollen clothing is extensively used in nearly all temperate countries except China and Japan.

For the production of wool, sheep require a cool, dry climate without extreme cold. The Temperate Grasslands of the Southern Hemisphere are thus eminently suitable; those of the Northern Hemisphere suffer from too great a cold in winter to form ideal sheep country. Thus at Dubbo, in the Australian sheep-rearing regions, the temperature ranges from 47° F. in July to 79° in January; at Graaf Reinet in South Africa from 51° in July to 72° in January. Wool-sheep thrive on comparatively poor herbage. With a rainfall of less than 10 inches, growth of grass or other fodder tends to become inadequate; with a rainfall of much over 30 or perhaps 40 inches the grass tends to become too luscious and the sheep suffer from foot rot and other diseases. Although dry conditions favour production of wool, the stock tends to become impoverished and may need to be replenished by strong, healthy animals from cooler, damper regions. Thus Australian sheep runs are replenished to a considerable extent from Tasmanian flocks.

Wool-bearing sheep fall into three main groups :

(*a*) Original English breeds. In the Middle Ages wool was not only an important product but a leading export of England. The English breeds have become widespread in South Africa, Australia and New Zealand.

(*b*) Merino sheep. These sheep are natives of North Africa, but were introduced into Spain and other grassy areas in Mediterranean lands in the Middle Ages and later into Saxony.

Fig. 34.—The principal flocks of sheep in the world.

They yield but very poor meat and are bred essentially for their wool. They have become very important in Australia and New Zealand as well as in South America and South Africa.

(*c*) Cross-bred sheep. These sheep are derived from cross-breeding between merinos and English strains. A large proportion of the Australian and New Zealand flocks are cross-bred. Cross-bred sheep yield both meat and wool.

Production of Commercial Wool.—(*a*) *Shearing.*—Shearing by machinery is now usual at most large sheep stations, and as the quality of the wool varies considerably from one part of an animal to another, the fleeces are usually clipped round or " skirted," the

inferior clippings being thrown into a separate bin. According to the age of the animal four grades of wool are distinguished :

(*a*) Lamb's wool from 7 months' old animals—the finest.
(*b*) Hoggetts from 12 to 14 months' old sheep.
(*c*) Wether wool from sheep of all other ages.
(*d*) Double fleece, representing two years' growth, is poorer in quality than a single-year fleece from the same animal and is cheaper.

Fleeces vary greatly in weight. Australian sheep average between $5\frac{1}{2}$ and 7 lbs. ; New Zealand sheep $7\frac{1}{2}$ lbs. A prize fleece may be as much as 30 or 40 lbs.

Wool is graded according to the " count " or number of 560-yard hanks that weigh 1 lb.

(*a*) Fine counts, from 60 to 90 hanks to 1 lb. These are chiefly merino wools and are short stapled ($2\frac{1}{2}$ to 6 inches).
(*b*) Medium counts, from 36's to 60's. These wools are usually long stapled (up to 12 inches) and include the wools of English breeds and the cross-bred Colonial wools of South America and Australia.
(*c*) Coarse or low counts, below 36's. These wools are more like hair, and include the wools of Southern Russia, Asia, and North Africa.

Wool as shorn from the sheep contains a large proportion of grease called " yolk " as well as varying proportions of dirt. It is usually exported " in the grease " and productions are quoted on a " greasy " basis. The wool may be washed to remove dirt, but if the grease is removed the wool felts or mats together.

(*b*) *Scouring.*—The wool is washed with water containing ammonia or some solvent to remove the grease. Greasy wool loses half its weight when scoured. The grease extracted is known as lanoline and is used in the preparation of toilet soaps. It should be noted that wool taken chemically from pelts is called " slipes."

(*c*) *Carding or Combing.*—Formerly it was usual for long-stapled wools to be combed out and then spun into worsted yarns. " Tops " is the technical term for the long hairs ; " noils " are the short hairs combed out. Short-stapled wools were " carded " (as with cotton) and spun into carded or clothing yarns suitable for " milled " or " fulled " cloth. According to modern practice some short-stapled wools can be combed, so that " combing wools " are not necessarily long-stapled or " carding wools " short-stapled.

(*d*) *Weaving.*—There are two main groups of cloths made from wool : (1) worsteds, in which the individual threads may be distinguished ; (2) woollens, in which the surface is " milled " so that

the individual strands are no longer to be distinguished. A blanket is a good example of the latter.

Australian Production of Wool.—Fig. 34 shows the number of sheep in the principal countries of the world; Fig. 35 the variation

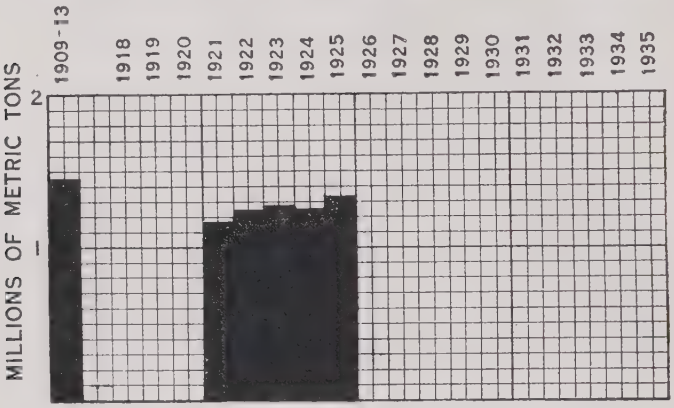

Fig. 35.—World production of wool.

(From the *Year Book of the Commonwealth of Australia.*) Figures collected by Textile Division of the U.S. Bureau of Commerce.

in wool production. In Fig. 36 the important place occupied by the Temperate Grasslands of the Southern Hemisphere should be noted.

The breeding of sheep for the sake of their wool is the most important of all the agricultural and pastoral industries of the Commonwealth, as well as one of the oldest. Australia has the largest flock in the world (104,000,000 in 1926), producing a fifth

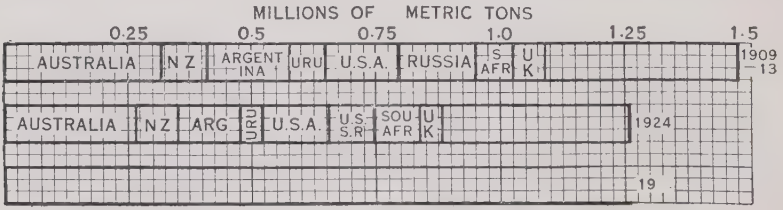

Fig. 36.—Production of wool in the principal producing countries, calculated on a "greasy" basis.

Each small division of the lateral scale represents 55,000,000 lbs. of greasy wool. (To be completed from the *Year Book of Commonwealth of Australia.*)

of the world's wool. The climatic control of sheep-rearing is illustrated in Fig. 37 (p. 33). Although attention is now being paid to the rearing of good mutton-sheep much of the Australian pasturage is suited only to wool-sheep. Sheep bred for mutton require a damper climate and better pasture than do those bred for wool. Mutton sheep are heavy, well-fed animals, thriving

FIG. 37.—Sheep lands of Australia, showing "climatic control."

Nearly all the sheep are found between the isohyets of 10″ and 30″ and nearly all in the temperate zone. Each dot represents 250,000 sheep (1924).

The maximum number of 106,421,000 sheep was reached in 1891, when, however, many of the runs were overstocked. The number of sheep and the production of wool in Australia fluctuate in a marked way with the rainfall. Enormous numbers of sheep perished in the great droughts of 1901-2, so that the number of sheep dropped to 54,000,000 in 1902.

FIG. 38.—Map of the World showing distribution of sheep.

Notice the marked concentration in the temperate grasslands of the Southern Hemisphere.

in such cool temperate climates as those of Britain and New Zealand. In the drier parts the sheep are allowed to wander over large areas in search of food. It is here that the competition of the ubiquitous

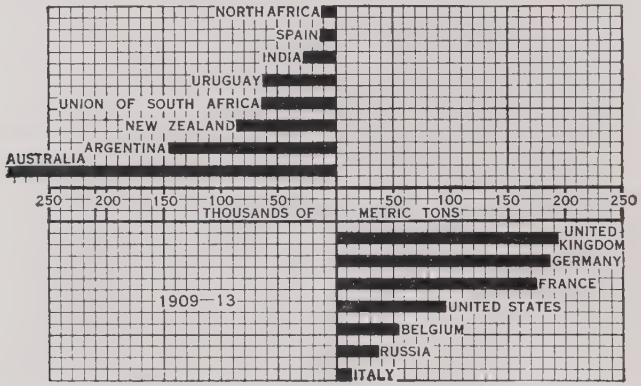

FIG. 39.—World trade in wool, 1909–13.

rabbit is very serious. Over large areas of the drier parts salt-bush and blue-bush afford good food, but do not quickly recover when closely cropped by sheep. Under existing conditions it is doubtful where the number of sheep in Australia could be profitably

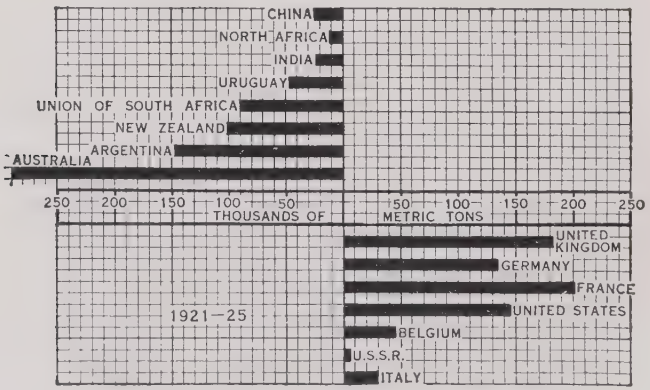

FIG. 40.—World trade in wool, 1921–25.

In 1924 wool to the value of £60,000,000 was produced in Australia and 90 per cent. exported.

increased; improvement in the weight of the average fleece is the obvious line of progress. Australian wool is mainly from the merino sheep, and the average pre-war production (again exceeded in 1924–25) was 700 million lb. Most of the wool is sold before export, the leading marts being Sydney, Melbourne, Geelong, Brisbane, Adelaide, Perth, Hobart, and Launceston. It is exported

mainly in the grease. Of recent years Australia has begun seriously to turn her attention to the home manufacture of woollen goods, and there are mills at Geelong, Sydney, and elsewhere, the annual output of which now exceeds £5,000,000 in value.

Live Stock.—Cattle.—Although the rearing of cattle is not nearly such an important industry as that of sheep, there are over 13,000,000 cattle in Australia. Beef cattle flourish on the ranching country of the savanas of Northern Queensland, Northern Australia, and Western Australia. Dairy cattle are kept in the wetter parts of

Fig 40A – Map of the World showing distribution of cattle.

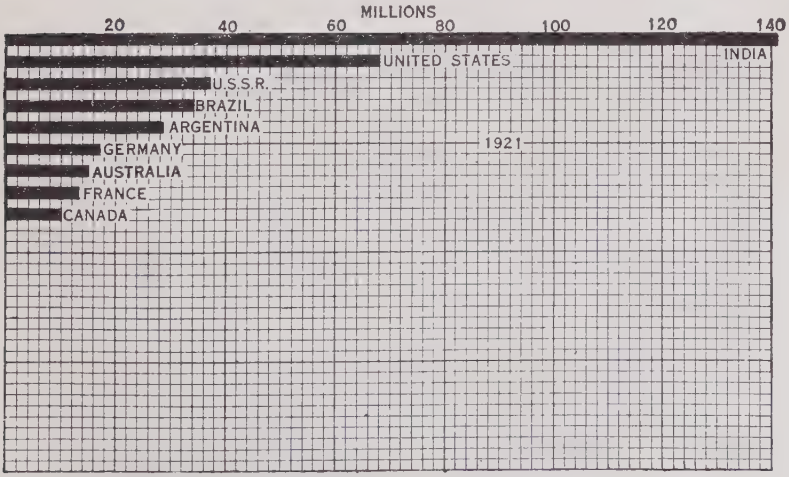

Fig. 40B.—Numbers of cattle in the principal countries.

the temperate regions, especially on the coastal sides of the Eastern Highlands in Victoria and New South Wales. The local consumption of beef is very large, and between 80 and 90 per cent. of the beef produced is eaten in Australia. Of recent years there has been a steadily growing production and export of butter, preserved milk, and cheese.

Other Live Stock.—*Horses.*—Horses flourish on the grasslands and are still very important in agricultural operations.

Pigs.—Under normal conditions there are nearly a million pigs in the Commonwealth, mainly in Victoria, New South Wales, and

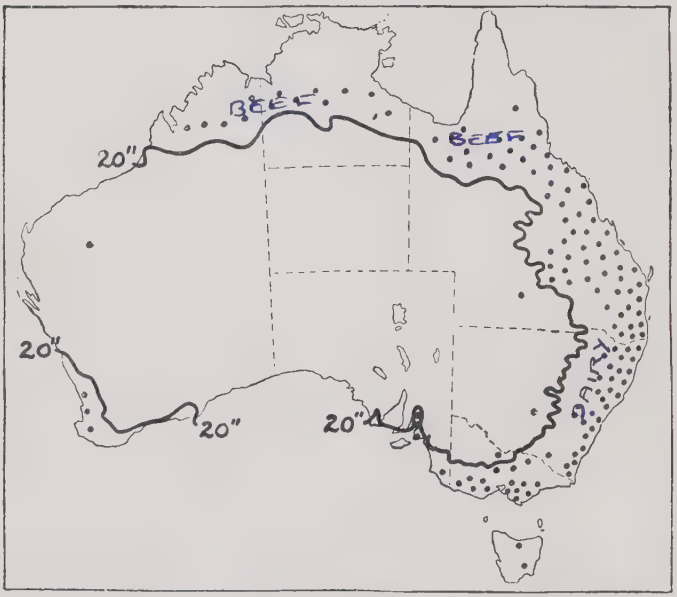

Fig. 41.—The distribution of cattle in Australia.
Each dot represents 100,000 cattle in 1924. Notice that they are nearly all found where the rainfall is more than 20 inches per year.

Queensland. The production and export of bacon and ham and lard reached high figures during the latter part of the War.

Poultry-keeping and *bee-keeping* are both industries capable of considerable expansion.

Artesian Water and Irrigation.—In a country such as Australia where the rainfall over a large area is very low and where even the scanty rainfall is irregularly distributed from year to year, irrigation and conservation of water are matters of great importance. Australia is fortunate in possessing a number of artesian basins, which are shown in Fig. 42. The artesian basins mark the sites of old gulfs of the sea which have been filled up with porous sandstones

overlain by impervious blue clays and other rocks. The water is imprisoned in the porous sandstones until the covering layer of clay is pierced. Whilst some geologists believe that the water originated deep down in the earth's crust and when used up will not be renewed, the majority hold that it is replenished by rain falling on the edges

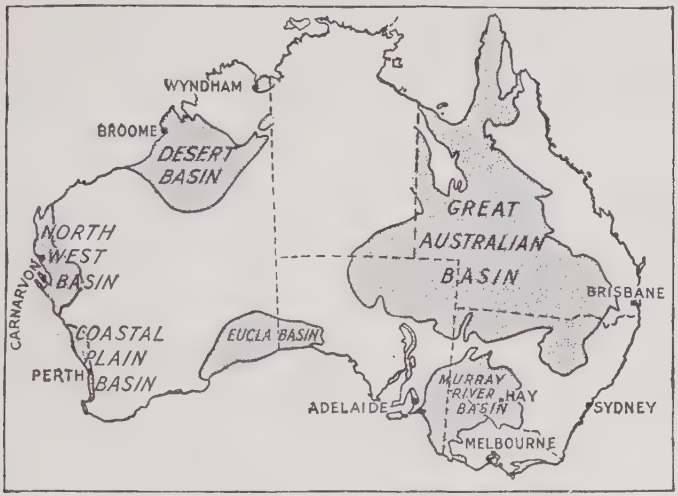

FIG. 42.—The artesian basins of Australia.
(From Report of the Fourth Inter-State Conference on Artesian Water.)

of the basins. The more important artesian basins of Australia are :

(1) *The Great Australian Basin* covers more than half a million square miles, including half of Queensland. In Queensland alone there are more than 4,000 bores, in New South

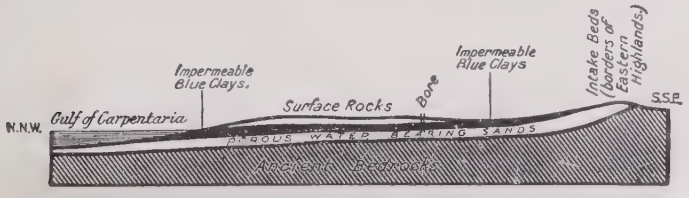

FIG. 43.—Section across the great artesian basin of Australia.
Notice the difference from the simple basin type.

Wales over 500, and in South Australia 50. The yield of water from flowing bores alone is about 350 million gallons per day. The water is excellent for watering stock, and is of paramount importance in the Queensland cattle industry. The deepest bores are over 5,000 feet in depth and the water issues at a high

temperature. It contains a considerable proportion of mineral salts, especially sodium carbonate, which would, in course of time, accumulate in the soil if the water were used for irrigation, for which it is not, therefore, suitable.

(2) *The Murray Basin* has not yet been greatly developed because water for irrigation is available from the Murray River.

(3) *The Eucla Basin* occurs in a part of Australia which is particularly dry and where water for irrigation is greatly needed. Unfortunately, in most parts of the basin the water is too heavily charged with salts to be suitable either for watering stock or for agriculture, and little has yet been done to develop the basin.

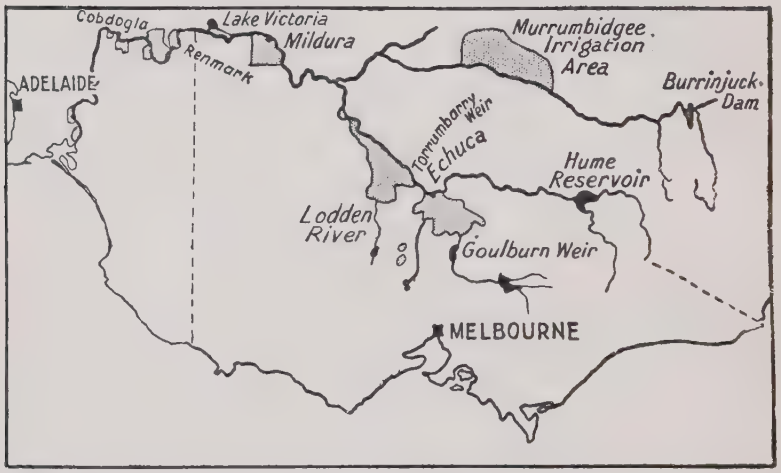

FIG. 44.—The irrigation works on the Murray and Murrumbidgee in New South Wales and Victoria.

(4) *The Coastal Plain Basin* supplies water to Perth, and a somewhat similar basin exists on the Adelaide Plains, whilst the *North-West* and *Desert Basins* in Western Australia have been as yet little utilized except to supply water at intervals to such centres as Broome and Derby along routes leading to them.

River Irrigation Works are important in the Murray Basin—the Nile of Australia. The use of the water has been regulated since 1914 according to the Murray Waters Agreement, and since 1917 irrigation and navigation schemes have been controlled by the River Murray Commission, the cost being shared equally by the Commonwealth Government and the Government of each of the three states concerned. There are at present three great projects in hand :

(*a*) The Hume Reservoir, near the junction of the Mitta Mitta and the Murray.

(*b*) The Lake Victoria Storage, to supply South Australia.

(*c*) The construction of 26 weirs and locks on the Murray and 9 on the Murrumbidgee.

Existing works include :

(*a*) The Murrumbidgee Irrigation area, supplied by the Burrinjuck (Barrenjack) Dam, 200 miles away—now a leading fruit and dairying district.

(*b*) The Curlwaa Irrigation area, supplied by water pumped from the Murray.

(*c*) The Goulburn Irrigation area, supplied from the Goulburn Weir.

(*d*) The Murray River Irrigation schemes, supplied by water from a weir 20 miles below Echuca.

(*e*) The Loddon River scheme, utilizing to a small extent the waters of the Loddon.

(*f*) Mildura, a small but intensely cultivated area supplied by water pumped from the Murray.

(*g*) Renmark and other irrigation areas in South Australia —important fruit-growing areas.

There are large numbers of smaller irrigated areas as well as water schemes under which the water is used for stock and domestic purposes only.

Population.—In 1850, before the discovery of gold, the population numbered a little over 400,000. By 1860 it had risen to 1,145,585. The census of 1921 showed 5,435,734 not including aboriginals. Before the close of 1926 it had passed six million. Owing to a low death rate natural increase is fairly rapid—14·4 per annum per 1,000. Australia is still very thinly populated, with an average density of under 2 per square mile. This may be compared with the United States, about the same area, with 40. Although the Commonwealth depends for its prosperity on its agricultural and pastoral industries only one person out of every three lives in the country. Nearly half the total population is concentrated in the six capital cities. Taking Australia as a whole, 95 per cent. of the population lives in the temperate regions, south of the Tropics. The greater part of Tropical Australia is virtually uninhabited. With the exception of the mining centres of Kalgoorlie and Broken Hill, the "dry heart" of Australia with less than 10 inches of rain (see Fig. 45), is also almost uninhabited. Although it is probable that more than a third of the continent—the arid interior—will never be appreciably developed (unless by mining), there is room for a big expansion in the temperate regions already populated and in the tropical regions with a good rainfall at present almost uninhabited.

Over 99 per cent. of the Australian population is of European descent. There are 62,000 aborigines, 18,000 half-castes of various

kinds, and 17,000 Chinese. Under what is known as the "White Australia Policy," the immigration of Asiatics and other non-European races has long been stringently restricted. Two important problems face the Commonwealth:

(*a*) Whether the tropical regions can ever be effectively developed without the help of coloured labour.

(*b*) Whether Australia will be reasonably able to prevent the influx of Asiatics when the extent of her undeveloped but desirable tropical regions becomes generally known in Asia.

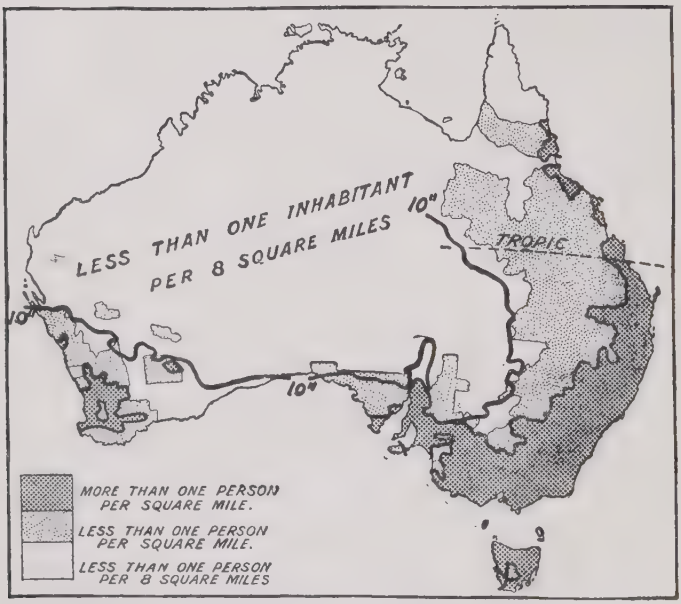
LESS THAN ONE INHABITANT PER 8 SQUARE MILES
TROPIC
MORE THAN ONE PERSON PER SQUARE MILE.
LESS THAN ONE PERSON PER SQUARE MILE.
LESS THAN ONE PERSON PER 8 SQUARE MILES

FIG. 45.—The distribution of population in Australia.
(Adapted from the *Commonwealth Year Book*.)

In the meantime, the Commonwealth is encouraging the immigration of Europeans and is making considerable progress in the development of tropical Queensland by European labour.

Communications.—*Railways.*—The Australian railway system grew up gradually round a number of independent points—the state capitals—each centre formulating its own policy independently of the others. Hence the mixture of gauges which is the great drawback of the Australian railways at the present time. The *Queensland Railways* are on the narrow or 3 feet 6 inches gauge; until recently there were four groups of lines connecting the ports of Cairns, Townsville, Rockhampton, and Brisbane with their respective hinterlands. These have now been linked together by a coastal line.

The *New South Wales Railways* are on the standard gauge (4 feet 8½ inches) and radiate in all directions from Sydney. The difficulty of crossing the Blue Mountains was not surmounted till 1875, and the bridging of the Hawkesbury River between Sydney and Newcastle was not completed till 1889. A coastal line between Sydney and Brisbane is now (1929) being completed ; but there is not yet a coastal line to Melbourne. Two of the three chief lines inland from Sydney make use of well-known natural gaps—the Cassilis Gate and the Goulburn Gap. The *Victorian Railways* are on the broad (5

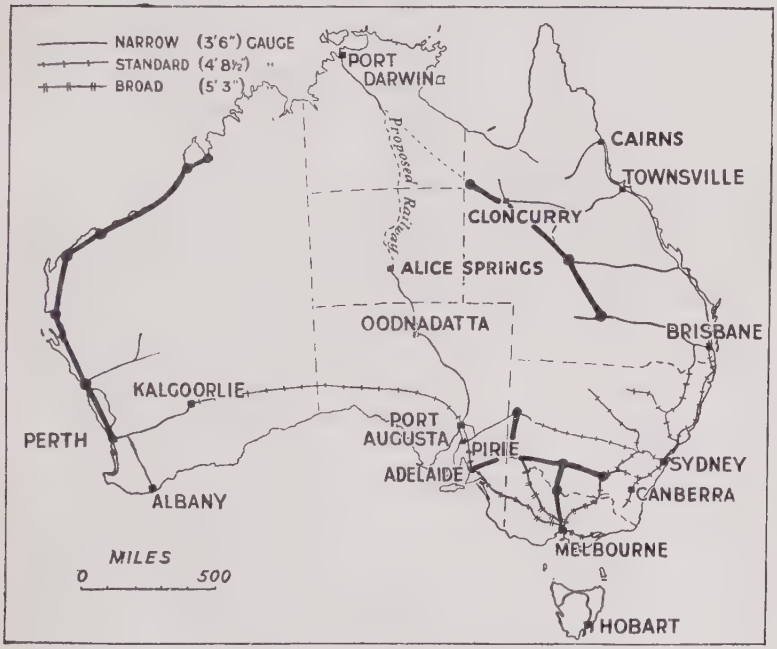

Fig. 46.—Railways of Australia, showing the various gauges.

The heavy black lines are the aerial routes in operation in 1925, and show how the aeroplane has been used in Australia to link up towns not yet served by rail.

feet 3 inches) gauge and radiate from Melbourne. The broad-gauge line extends to Adelaide. The *South Australian Railways* use all three gauges (see Fig. 46). The *Trans-Continental Railway*, completed in 1917, connects Port Augusta in South Australia with Kalgoorlie in Western Australia. It is on the standard (4 feet 8½ inches) gauge. It is owned and operated by the Commonwealth, as will be the north-south continental line from Darwin to Oodnadatta now in course of construction. The *Western Australian Railways* radiate from Perth and serve particularly the agricultural regions, especially the Wheat Belt. *The Tasmanian Railways*, on

the narrow gauge, afford interesting examples of the way in which railways in mountain country are forced to follow river valleys.

Roads.—It cannot be said that Australia is, as yet, well supplied with good roads. The Prince's Highway, following the coast, affords an alternative route to the railway from Sydney to Melbourne and Adelaide, but elsewhere the roads supplement and feed rather than replace the railways. Fortunately, much of Australia

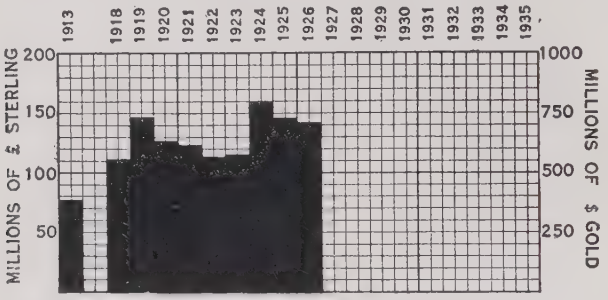

FIG. 47.—The exports of Australia (total exports of Australian produce including gold).

After 1913, years refer to financial year ending 30 June (1918 refers to 1918–19, etc.). From the *Stateman's Year Book.*

is comparatively level and free from permanent watercourses, so that in the dry season the ubiquitous motor-car can be used, almost without need of definite roads, to communicate with outlying states.

Aerial Transport.—See Fig. 46.

The Foreign Trade of Australia.—Owing to the large and increasing urban population of Australia, a number of products

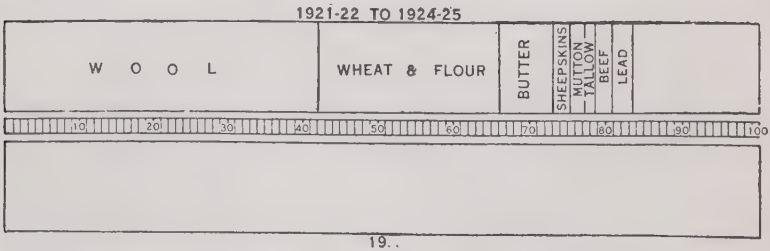

FIG. 48.—The exports of Australia. This diagram *excludes* gold.

(such as sugar) do not figure amongst the exports but are consumed at home. This is true of most manufactured goods.

Exports.—Fig. 47 shows the increase in value of exports in recent years. The next figure shows the principal exports and their relative values. The diagram has been drawn for the average of the years 1921-25. In 1926 the proportions (out of a total of £145,000,000) were wool, 41·5 per cent. (Australia is the largest

exporter of wool in the world); wheat, 14·4 per cent.; wheat flour, 4·3 per cent. Other exports, valued at more than £1,000,000 each in 1926, include gold, 7·7 per cent.; hides and skins, 5·9 per

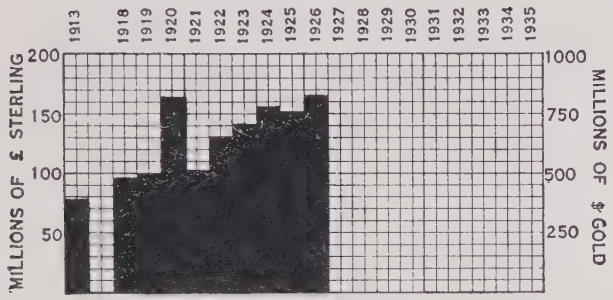

FIG. 49.—The imports of Australia (total imports including re-exports).

After 1913, 1918 = year 1918–19 ending 30 June 1919; 1919 = 1919–20, and so on. (From the *Statesman's Year Book.*)

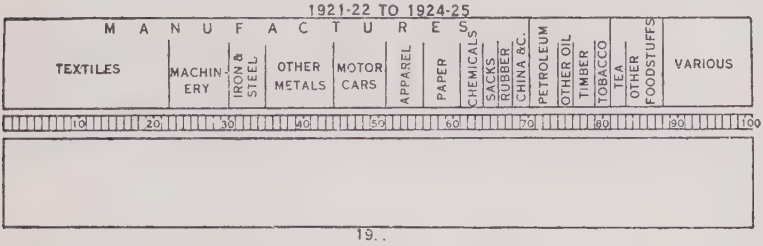

FIG. 50.—The imports of Australia.

cent.; butter, 3·8 per cent.; meats, 3·6 per cent. Notice that all the leading exports are raw materials, as Australia is still in the primary producing stage, although manufactures are developing.

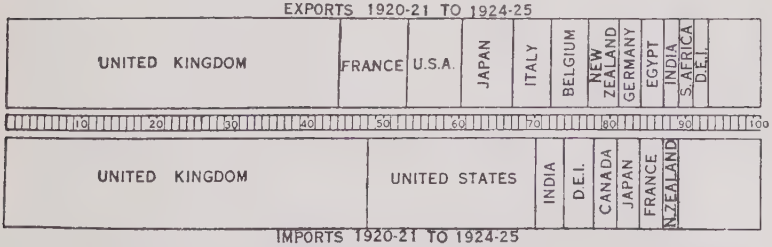

FIG. 51.—The direction of the foreign trade of the Commonwealth of Australia.

Imports.—Fig. 49 shows the movement in recent years in the value of imports. Nearly all the leading imports are manufactured goods which at present can be produced more cheaply in other

countries than in Australia. A few of the imports are foodstuffs or raw materials, such as tea and soft timber, which may be produced in Australia in the future.

Direction of Trade.—Taking the average of 1920–25, more than half the exports of Australia go to other parts of the British Empire; 44 per cent. going to the United Kingdom alone. Of foreign countries, France, Japan, United States, Belgium, Italy, and Germany have of recent years been Australia's best customers. Of the imports nearly half come from the United Kingdom, and nearly a quarter from the United States.

Ports.—A very large proportion of the foreign trade of the Commonwealth passes through the five capital cities and ports of Sydney, Melbourne, Adelaide, Brisbane, and Fremantle (Perth).

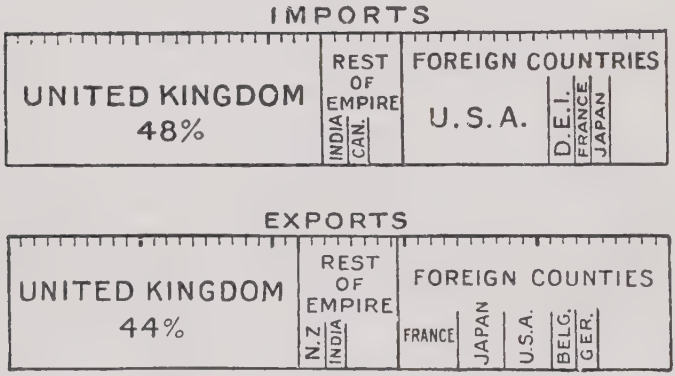

Fig. 52.—The direction of Australian trade. Average of the years 1920–25.

The average value of the imports was £139,000,000, and the exports £132,000,000.

These five have over 90 per cent. of the whole trade, Sydney alone accounting for a third of the whole. The minor ports, roughly in order of the importance of their trade are: Newcastle, Port Pirie, Hobart, Geelong, Wallaroo, Townsville, Launceston, Bunbury, and Rockhampton. In each case the trade is over £1,000,000 annually. Darwin's trade was only £22,000 in 1924.

THE HISTORICAL GEOGRAPHY OF AUSTRALIA

Early Explorations.—The discovery of Australia was due to the birth of modern science and the growth of European navigation and commerce, which led in the sixteenth century to the occupation of the East Indies and Philippines by the Spanish, Portuguese, and

Dutch. There is some possibility that the Portuguese vessels from the north explored parts of the Australian coast before the end of that century, but the first recorded discovery made was that of the north coast by William Jansz in the *Duyfken* early in 1606. Later in the same year the Spaniard Torres sailed through the strait which now bears his name and sighted to the south the high land of Cape York.

In 1611 the Dutch thought of using the Anti-Trade Winds as a means of reaching the East Indies from the Cape of Good Hope.

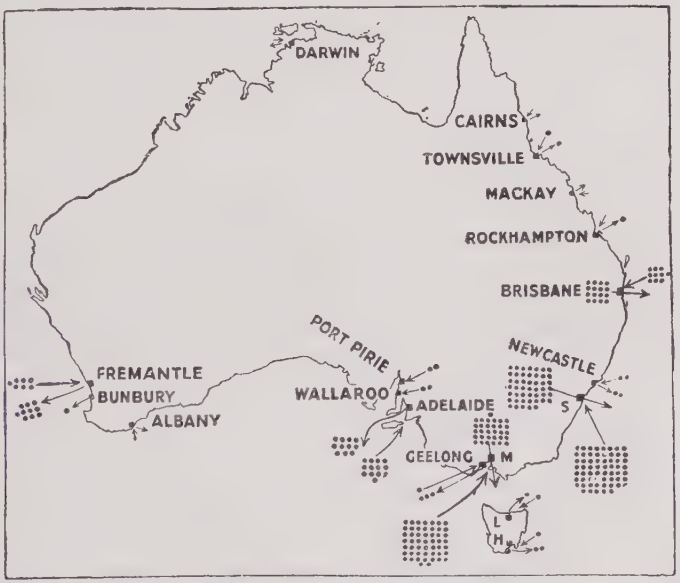

FIG. 53.—The trade of the principal ports of Australia (1923–24 and 1924–25). Each dot represents approximately £1,000,000 value of goods. Notice that imports and exports are separately shown. Where no dots are shown the trade is less than £500,000.

Their vessels then sailed further eastwards before turning north, and from 1616 onwards began to sight and explore the western coast of Australia. In 1642 Tasman was sent from Java to explore this southern land, and to see if a great southern continent existed. His expedition added to the map New Zealand and Van Diemen's Land or Tasmania, as it was subsequently called, but in neither case was it known that the land discovered was an island. The Dutch, who sought only trade, gave a poor account of Australia, as an arid country inhabited by fierce savages, an opinion shared by William Dampier, the first English explorer, who visited the north-west coast in 1688 and 1699. More favourable, however, was the outlook when an English scientific expedition, led by James Cook and Joseph Banks, discovered the fertile eastern coast in 1770. Cook

explored the coast from Cape Howe to Torres Strait and named the most important features, such as Botany Bay and Port Jackson. The whole region he named and took possession of under the title of New South Wales. In 1814, at the suggestion of the explorer Flinders, Britain adopted another name for the continent as a whole, and the New Holland of the Dutch and the New South Wales of Cook became known as Australia—the land of the South.

Settlement.—After the American War of Independence James Matra, who had probably sailed as midshipman under Cook, suggested the establishment of American Loyalists in New South Wales. The project failed, but upon it Lord Sydney and Banks built the idea of founding a convict colony to replace the fields of convict emigration lost with America, particularly as tropical Africa had proved unsuitable owing to its climate. In January, 1788, Captain Phillip with 11 vessels, 700 convicts, and 200 marines anchored in Botany Bay, which appeared a less satisfactory site for settlement than the magnificent harbour of Port Jackson, which was explored within a few days. On the coastal plain around Sydney, therefore, grew up the first convict settlement in Australia, a solitary colony until 1803, when a branch spread to the Derwent, owing to a groundless fear of French occupation. Meanwhile Flinders, Bass, and others conducted coastal voyages, which proved Tasmania to be an island, discovered the South Australian gulfs, and mapped in outline most of the Australian coast.

For twenty-five years (1788–1813) official policy and the peculiar formation of the Blue Mountains confined the Sydney settlement to the coastal plain, but Macarthur had introduced the merino sheep in 1797, and when Lawson, Blaxland, and Wentworth crossed the ranges in 1813, and Bathurst was established, an uncontrollable flood of squatters occupied the western slopes of the divide, and swept northwards and southwards into what are now Queensland and Victoria. The lack of geographical barriers, except the central deserts, the weakness of the native peoples, and the uniform race of the incomers made progress more rapid than in any other continent. At the same time explorers, such as Mitchell and Sturt, opened up the Murray-Darling Basin, the latter tracing the Murrumbidgee-Murray to Encounter Bay in 1829–30. Australia now became with great rapidity something far more than a convict settlement. Ports were established at Albany and on the north coast through fear of the French and Dutch, and in 1829 and 1836 Swan River and South Australia were founded as free colonies for British emigration. Melbourne was occupied in 1835 by squatters from Tasmania, and companies colonised the Hunter River Valley and north-east Tasmania. The new settlements met with varying success, although on the whole they succeeded. Settlers on the rich lands of Victoria and in the fertile Central Highlands and Rift

Valley Plains of South Australia made better progress than those in the varying country and heavy timber of south-west Australia, where from 1849 to 1867 convicts were introduced to aid progress. Nevertheless, over much of the moister parts of the east, south-east, and south-west the squatters were well established before the period of the mineral discoveries.

In 1842 copper was discovered in South Australia, and in 1851 gold was found in Victoria and New South Wales; then came a burst of prosperity which precipitated Australia into nationhood and led to a vast increase in the agricultural and pastoral industries, which provided the miners with food and offered a field for the investment of their gains. Of a similar nature was the progress which followed in Western Australia from the gold discoveries of 1892. Free settlement was then strong enough to abolish conviction in Eastern Australia and Tasmania by 1853. Victoria became a separate state in 1851, and Queensland in 1859, while between 1856 and 1859 all the colonies except Western Australia received responsible Parliamentary Government.

There still remained, however, the solution of great problems such as unification, closer settlement, and the exploration and occupation of the drier regions of the continent. The last question was partly met by the explorations of Eyre, Leichardt, Mitchell, Kennedy, and Gregory, who between 1839 and 1860 opened the way for Burke, Wills, and Macdonall Stuart's crossing of the continent in 1861 and 1862. Again the chief motive of exploration was the needs of the squatters, and again the explorations led to a squatting occupation of vast areas of country. The arid interior and the tropical lands of the north were divided between Queensland, Western Australia, and South Australia—the last gaining the central north or "Northern Territory" through the results of Stuart's expeditions. With a comparatively small amount of fertile land South Australia was early driven into efforts to expand, and in the 'fifties and 'sixties sought to command the Northern Territory and the commerce of the Murray-Darling Basin. Both tasks, however, proved beyond the powers of her small population and financial resources. Difficulties of climate, soil, and communication proved insuperable in the Northern Territory, while the growth of railways and the natural outlet to Melbourne ruined the Murray trade.

The following years saw a great growth in pasturing through improvements in stock breeding and in water supply. Agriculture also made great strides owing to the introduction of dry farming, fertilisers, and drought-resisting wheat.

As early as the 'fifties the Australian states felt the need of acting together, as in matters of trade, but for a long time each went its own way, often imposing tariffs detrimental to its neigh-

bour. Later, the need of a common defence and a common policy against Chinese immigration and against German aggressiveness in New Guinea brought the question of Union into prominence. At length, through the work of great statesmen such as Sir Henry Parkes, the various states agreed to federate, and, in July, 1900, Queen Victoria gave her assent to the formation of the Commonwealth Government, which came into operation in 1901. In 1908 the site for the new capital was selected, and it was named Canberra in 1913. The year 1927 witnessed the opening of the Commonwealth Parliament there.

Federation has already produced remarkable results. The adoption of a high uniform tariff with protection for local manufactures has greatly increased the population and power of the capital cities, which were already established in favourable geographical sites, and now contain some 46 per cent. of the whole population of Australia. At the same time the great problems of the Murray and Northern Territory have been taken over by Australia as a whole, with the result that despite great difficulties progress is being made. Political unification is now being accompanied by unification in other spheres. Combined action in such matters as the Great War, communications, defence, and industrial legislation show that the people of the Australian states are becoming a united nation in deeds as well as in race and name.

Government.—The mother state of New South Wales was at first governed solely by the Governor in person. A Legislative Council, the members of which were appointed by the Colonial Office in London, was established in 1825. In 1842 the beginning of representative government was made by the setting up of a Legislative Council of thirty-six members, twenty-four of whom were elected. Meanwhile Tasmania (still known as Van Diemen's Land), South Australia, and Western Australia were each being governed by a Governor or Lieutenant-Governor with a nominated Council.

During the gold rushes of the 'fifties there came to Australia people of many nations imbued with a spirit of liberty. New constitutions were framed, based on the British model.

This is broadly the basis of the present constitutions, both of the State Governments and the Federal Government.

THE STATES AND NATURAL REGIONS OF AUSTRALIA

QUEENSLAND

With the exception of Tasmania, none of the states of Australia forms a complete natural region, as in each case the inland boundaries are almost entirely artificial in character.

Queensland falls quite simply into three main regions:

(1) The Queensland Highlands.
(2) The Great Artesian Basin.
(3) A fragment of the Western Plateau of Australia.

The Queensland Highlands.—This belt of country, varying from 100 to 300 miles wide, stretches from Cape York in the north to the borders of New South Wales in the south. There is, as a rule, little coastal plain. Instead, a belt of hard granitic rocks gives rise to a series of coastal ranges, which have rendered very difficult the construction of the coastal railway line from Brisbane to Cairns. The coast is fringed with many rocky islands—the result of a sunken coastal block—and for 1,200 miles the Great Barrier Reef runs parallel to the coast. Between the reef and the shore is a shallow inland sea, well protected from the stormy waves of the Pacific. Through this sea ply steamers between Japan, China, Singapore, Java, and Australia, and a voyage in one of them enables one to appreciate the rocky nature of the coast. Southwards from the end of the Barrier Reef several large sandy islands fringe the shore, and there are larger areas of comparatively level land. Behind the coastal granite ranges are large areas of hard, old sedimentary rocks,

culminating in the Great Dividing Range. In many places the old rocks are rich in minerals, and the principal towns are either in the mining districts or have arisen as ports for them. Thus Cooktown is the outlet of the Laura Goldfield; Cairns of the Chillagoe tin and copper mines; Townsville of the Charters Towers Goldfield; and Maryborough of the Gympie mines. Rockhampton (25,000 in 1921) is particularly important, as it is situated on the Fitzroy

Fig. 54.—Queensland.

River, exports the copper and gold of the famous Mount Morgan gold mines, and, as it commands a most important gap in the Eastern Highlands, is the outlet for the products of the interior. Several of these ports—Cooktown, Townsville, and Rockhampton—command breaks in the ranges and are linked by rail with the interior, so that the Artesian Basin forms their hinterlands. Owing to the difficulty of communication along the eastern coast of Queensland,

and the important breaks in the ranges, a larger number of seaports have grown up than in any other state, and Queensland has so far been able to avoid the excessive concentration of population in the capital.

The greater part of this region lies in the Tropics and enjoys a good rainfall from the Trade Winds. But level agricultural land is not abundant and is found mainly in the broader river valleys. Sugar cane is an important crop, and many tropical plants can be grown. This region, for example, produces nearly all the bananas grown in Australia. Mackay is the chief sugar-manufacturing centre and port; other sugar ports are Bundaberg and Maryborough. Many of the rivers of the area reach the coast through deep gorges and over fine waterfalls (*e.g.* the Baron Falls near Cairns), but the larger Fitzroy River has a broader valley with fine cattle pastures and has become a centre of population. The rich but undeveloped Dawson Coalfield lies in this valley.

Brisbane (265,000 in 1925), the capital city, lies in the south on the Brisbane River, a few miles from the sea. The mouth of the river is protected by Moreton Island. Near the capital is *Ipswich* (21,000 in 1921), a manufacturing town on the most important coal field in Queensland. At the back of Brisbane, on the surface of the plateau, are the fertile Darling Downs, the chief centre of which is Toowoomba (23,000 in 1921). Thus the capital owes its importance to the fact that the Brisbane River has been made navigable by dredging, that it is the centre of the railway system and commands the produce of the Darling Downs and the Ipswich coal field.

The Great Artesian Basin.—The great Artesian Basin may be divided into two parts:

(*a*) The south-western, forming part of the Lake Eyre region of inland drainage, and constituting an arid region containing only a few scattered stock. Opals are found near Winton.

(*b*) The eastern and larger part, forming the great cattle-ranching area of Queensland. This cattle-raising region of Queensland lies between the isohyets of 10 and 20 inches, and corresponds to the savana belt. In the north, around the shores of the Gulf of Carpentaria, are low-lying areas with mangrove swamps and scrub forest, but the greater part of the region is one of rich grass with scattered trees. On the borders of the Gulf lies *Normanton*, the chief town. As already mentioned, the stock-raising districts are connected by rail through the highland gaps with the east-coast ports of Cairns, Townsville, Rockhampton, and Brisbane. The artesian water is used mainly for watering the stock. In the more temperate south sheep become important, and this part of Queensland adjoins the Wheat Belt of New South Wales.

The Western Plateau.—Near the borders of North Australia (formerly the Northern Territory) Queensland includes a portion of the ancient rocks of the Western Australian tableland. This tract is known as the Barkly Tableland, and consists of well-grassed country. On the borders of the plateau lies Cloncurry, an important copper-mining centre, connected with Townsville by rail.

An important project to link Cloncurry with Darwin by railway would place the eastern states in comparatively quick communication with India and Europe, *via* Darwin, and such a railway would

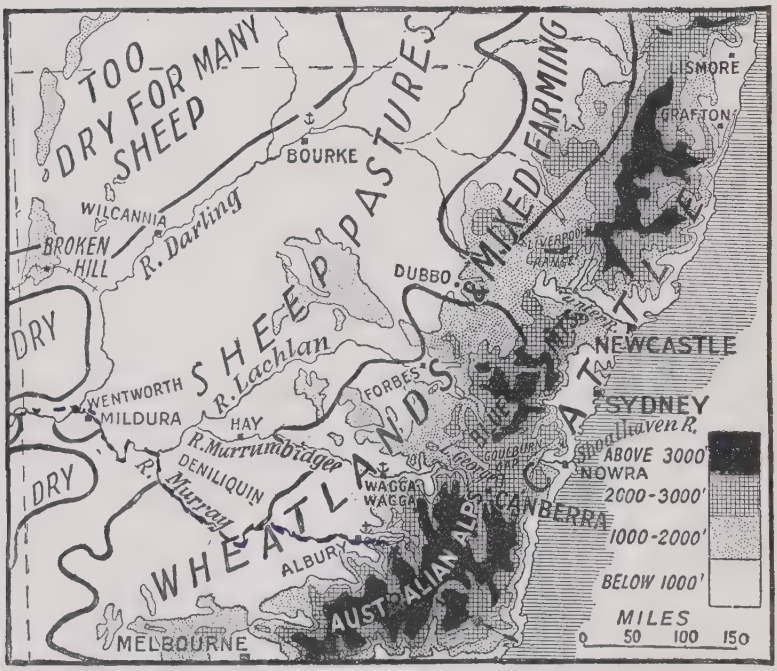

Fig. 55.—New South Wales.

also open up important areas of grassland at present practically uninhabited. There is at present a well-marked "stock route" from Western Queensland through North Australia to Darwin.

NEW SOUTH WALES

The Mother State of the Commonwealth is still in many respects the most important. It has the largest population and the largest foreign trade, the largest coal fields and by far the largest number of sheep. It can be divided into a number of natural regions which agree closely with those of Queensland:

(1) The Eastern Highlands of New South Wales.
(2) The Central Lowlands, comprising:
  (*a*) The southern part of the Great Artesian Basin.
  (*b*) The major part of the Murray-Darling Basin.
(3) The Broken Hill Massif in the extreme west.

The Eastern Highlands.—The Eastern Highlands in New South Wales form a somewhat narrower belt than in Queensland, not as a rule exceeding 150 miles in width. They may be divided into three parts:

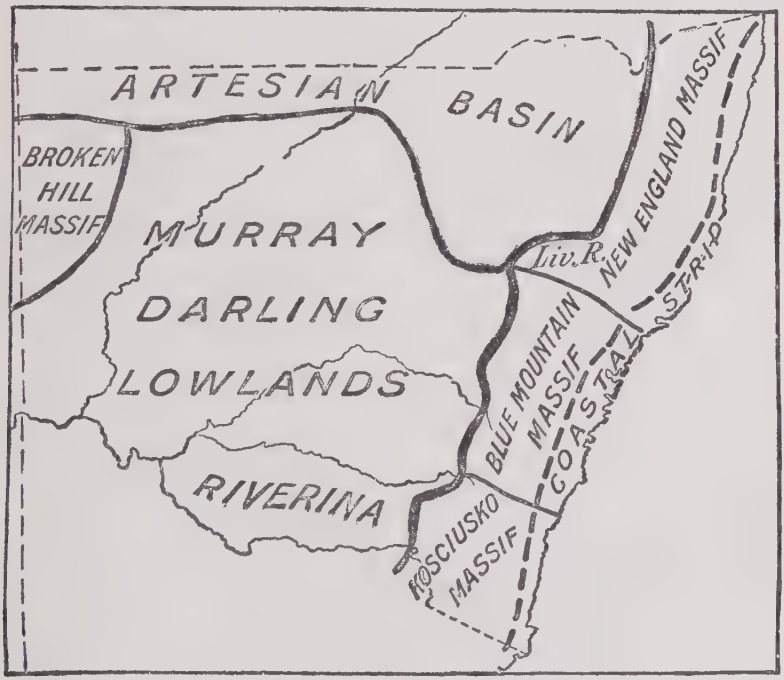

FIG. 56.—The natural regions of New South Wales.

(*a*) The New England Massif in the north, stretching as far south as the Liverpool Range and the Hunter Valley.

(*b*) The Blue Mountains Massif, stretching roughly from the Hunter Valley to the Goulburn Gap.

(*c*) The Kosciusko Massif, from the Goulburn Gap to the Victorian border.

The New England Massif consists of old sedimentary rocks invaded by masses of granite. The eastern slopes are rugged but are well wooded, and comprise one of the few soft-wood areas in Australia, the red cedar in particular being highly prized. The

drier western slopes are less rugged and are devoted to agriculture and sheep-rearing. The present main railway from Brisbane to Sydney runs through this district, of which Armidale is one of the main centres. The " English " character of the country is marked by flourishing deciduous trees—especially apples. Lower down the western slopes one passes into the Wheat Belt.

Between the New England Plateau and the sea is a coastal strip of varying width, watered by the " North Coast Rivers "—the Tweed, Richmond, Clarence, Macleay, and Manning. In the north sugar cane is grown, and the whole area is an important dairying region. Murwillumbah, Lismore, and Grafton, now connected with Sydney by the North Coast Line, are the main centres of this delightful country.

Special mention may be made of the broad and fertile Hunter Valley, which separates the New England and the Blue Mountain massifs, forming the important Hunter River Gap and Cassilis Gate to the interior. The valley is renowned for its fertility, though liable to serious floods. At the mouth is Newcastle (98,000 in 1925), the principal coal port of Australia, and a manufacturing centre which is greatly increasing in importance.

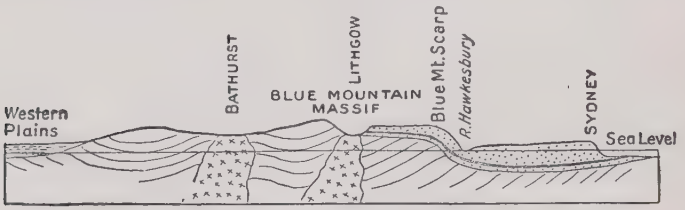

FIG. 57.—Section from west to east across the Blue Mountain Massif.

The Blue Mountain Massif consists essentially of a broad flat-topped plateau formed of dry massive Hawkesbury sandstone. The remarkable and sudden eastern edge of the Blue Mountains is due to a type of fold known to geologists as a monocline, illustrated in Fig. 57. Thus the coastal strip north and south of Sydney consists of exactly the same sandstone as the Blue Mountain Plateau, which is nearly 3,000 feet higher. This plateau has been dissected by a series of remarkable valleys formed by rivers, which have cut through the hard sandstone and rapidly eaten into the softer beds below and emerge on to the coastal plains through impassable gorges. On the Blue Mountains a number of pleasure resorts—Katoomba, Leura, etc.—have sprung up, and the residential suburbs of Sydney stretch northwards to the sandstone areas. Along the coast are several drowned valleys, affording excellent harbours. Of these Port Jackson (Sydney Harbour) and Broken Bay (which receives the Hawkesbury River) are the most famous. Notice that the so-called " Parramatta River " is only a short arm of the sea,

and that no river empties itself into Sydney Harbour. This is one reason why the harbour remains free from sediment. Underlying the Triassic Hawkesbury sandstone are the coal-bearing beds which yield the coals of the Newcastle and Illawarra districts. The coal seams are exposed or are near the surface along the coast south and north of Sydney, and at Lithgow on the western side of the Blue Mountains. At Sydney the coal measures lie at a depth of 2,800 feet, the whole forming "a huge black saucer, extending under the whole country from Newcastle to Lithgow in the west, and to Bulli in the south."

Sydney, the capital (899,000 inhabitants in 1921, 1,040,000 at the beginning of 1926), owes it importance to its splendid harbour, fine climate, rich hinterland, and midway position between the coal fields of Newcastle and Wollongong, as well as to political and historical associations as the capital and mother city. It contains some 40 per cent. of the inhabitants of New South Wales, and is the fifth town in the Empire in point of size. Around Parramatta a layer of clay covers the sandstone and supports a number of orchards. Further south, in the lower valley of the Shoalhaven River, is an important dairying centre. Nowra is the collecting centre and railhead for this tract.

On the western side of the Blue Mountains Plateau, Lithgow (13,000 in 1925) uses its coal for important manufactures, such as that of small arms. Further west are volcanic rocks associated with the old sedimentary rocks, and this drier region approaches the Wheat Belt.

The Kosciusko Massif, lying south of the Goulburn Gap and Lake George, boasts the highest mountain in Australia—Mount Kosciusko. Mount Kosciusko is a granite boss rising to 7,350 feet above sea-level, but the surrounding country, though fine, has not the essentially rugged character of fold mountains in other parts of the world. Amongst the hills of the massif lies the Federal Capital—Canberra.

Some of the heavy rainfall of the region will be caught by the Burrinjuck Dam and Hume Reservoir already mentioned. The area is at present a cattle district. There is no distinct coastal strip, but the flatter land round the river mouths affords excellent pasture for dairy cattle.

The Central Lowlands.—Although the northern part of the Central Lowlands in New South Wales forms part of the Great Artesian Basin, whilst the bulk belongs to the Murray-Darling Basin, there is little difference between the two parts. Generally speaking :

(*a*) The land slopes away gradually from the borders of the Eastern Highlands towards the west.

(*b*) The rainfall decreases from east to west, and the type of industry changes accordingly.

(*c*) The rivers are more constant in the south than in the north, so that more water is available for irrigation.

For the most part the lowlands are occupied by young sedimentary rocks, but near the Eastern Highlands patches of older rocks may appear from beneath the younger cover and give rise to such mining centres as those of Cobar and Wyalong.

The famous Wheat Belt forms a broad strip along the east of the region, being roughly limited on the west by the 20-inch rainfall line. Amongst the agricultural centres of this belt may be noted Dubbo, Forbes, Wagga Wagga, Albury, and Corowa.

The sheep country on the whole lies mainly to the west of the Wheat Belt, and it is in this country that great irrigation developments are taking place. It would perhaps be more correct to state that the main Sheep Belt coincides with the Wheat Belt, but that sheep thrive also both in the more hilly regions on the slopes of the Eastern Highlands and in the drier regions (with a rainfall of 10

Fig. 58.—Section across New South Wales from west to east.

inches or less) west of the Wheat Belt. Thus, towns like Bourke, Hay, Deniliquin, Wilcannia are important wool centres, but lie outside the wheat area. Wilcannia is a river port on the Darling.

Special mention may be made of the famous "Riverina," lying between the Murrumbidgee and the Murray. The eastern part is in the Wheat Belt, the western part in the pastoral belt. The soil is famed for its fertility, but its full fertility can only be developed by irrigation.

In the extreme south-west the Murray-Darling Basin is still drier, and depends entirely on irrigation for development. Wentworth is a river port lying in this area, but at present the Victorian settlement of Mildura is the most important of the irrigated tract.

Broken Hill Massif.—This mass of old rocks is a continuation of the South Australian Highlands, and lies near the western border of New South Wales. The immensely rich silver-lead deposits lying in saddle lodes have made Broken Hill famous. Great quantities of zinc are now obtained, and this metal is becoming one of the most important on the field. The mineral riches of Broken Hill have attracted a population of some 30,000 people. Owing to the factor of distance the outlet of the field is Port Pirie on Spencer Gulf in South Australia. A railway has been completed from Broken Hill to Sydney, *viâ* Menindee and Condobolin, but the distance is so great that it is not likely to affect the transport of ore through the South Australian port.

VICTORIA

In Victoria the main mountain divide has swung round into an east-and-west direction. At the same time the coastal strip has increased greatly in breadth and altered somewhat in character. We find that the State can be divided into four natural regions:

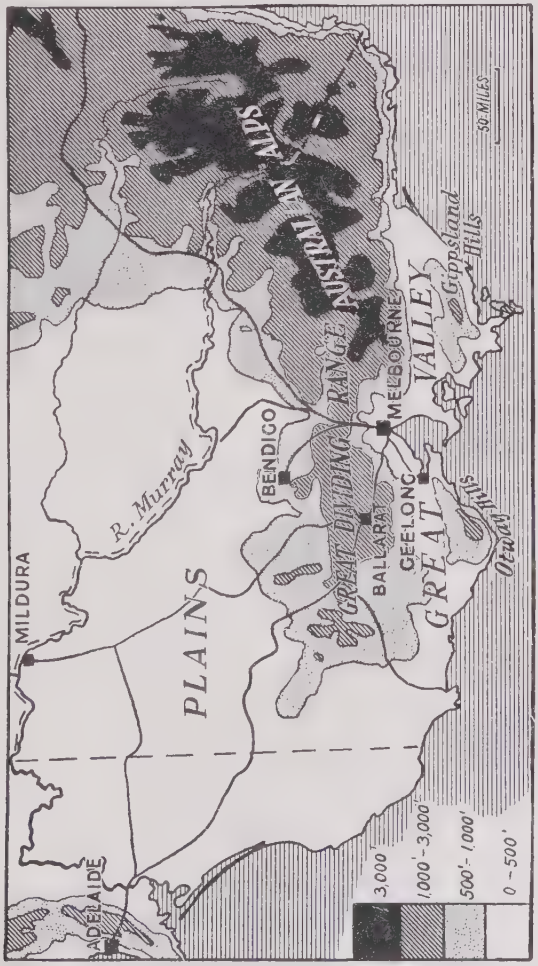

Fig. 59.—The natural regions of Victoria.

(*a*) The Mallee Scrub country and Wimmera District, lying north of the Victoria Mountains and forming part of the Murray Basin.

(*b*) The Victorian Highlands.

(*c*) The Great Valley of Victoria.

(*d*) The Otway and Gippsland Hills.

The Murray Basin.—North of the Victorian Highlands lies the continuation of the Wheat Belt of New South Wales. To the north-west lies the mallee scrub country, which, in spite of a low rainfall, is of increasing importance as a wheat area. We have already mentioned the use made for irrigation of the Goulburn and Loddon rivers, and of the Murray itself below Echuca and in the fruit-growing settlement of Mildura.

The Murray Basin is also one of the great sheep-farming regions of Victoria. Echuca, on the Murray, only 160 miles by rail from Melbourne, through the low Kilmore Gap, is one of the leading centres in this part of Victoria.

The Victorian Highlands.—Like the New England Highlands, the Victorian Highlands consist of old sedimentary rocks, penetrated by the masses of granite, and in places covered by flows of basalt (as at Ballarat). The Highlands are loftier in the east, where they are known as the "Australian Alps," and have more than a dozen peaks exceeding 5,000 feet in height. Of these Feathertop with its snowy cap (6,300 feet) is one of the best known. The Australian Alps form the feeding ground of the headwaters of the Murray and the various streams used for irrigation in the north. Amongst the Victorian Highlands lie several of the most famous of the Australian gold fields—Bendigo, Ballarat, and Castlemaine—although few of these centres now have a great production. The western part of the Highlands is lower and drier and may be described as rolling uplands well suited to wheat. An important centre is Ararat. The vine flourishes in this part, and over the whole area much land is devoted to sheep.

The Great Valley of Victoria.—To the south of the Victorian Highlands lies the Great Valley of Victoria, separated from the sea by the low Otway and Gippsland Hills. The Great Valley is divided into two halves by Port Phillip. The eastern half is a fertile dairy-farming country, studded with lakes, and known as Gippsland. Sale and Morwell are the chief centres of this part. Further west lies thickly timbered country with some of the largest hardwood eucalypts in Australia. Port Phillip is the central part of the Great Valley which has been drowned by the sea. Notice the excellent position of *Melbourne* (912,000 inhabitants in 1925) at the head of Port Phillip. It is the natural geographical centre of Victoria, and no other position is possible for a town to command both ends of the Great Valley as well as the country north of the Highlands through the Kilmore Gap. Most of the larger ships berth at Williamstown and Port Melbourne, but the Yarra is navigable for vessels of considerable size. Along the shores of Port Phillip Bay are numerous pleasant suburbs and pleasure resorts.

Geelong (39,000 in 1925) is an important and growing industrial centre, lying at the head of Geelong Harbour, an inlet on the west

side of Port Phillip Bay. It has a number of woollen mills, and its hinterland, the western half of the Great Valley, is part of the great Victorian sheep country. That part of the Great Valley lying around and west of Port Phillip Bay has rich volcanic soils—hence the old designation "Australia Felix." Large areas are devoted to wheat and vegetables, but sheep largely take the place of the dairy cattle of the eastern parts of the valley. *Hamilton* is the main centre of the western part of the valley, and was long

FIG. 60.—The position of Melbourne.
Land over 1,500 feet shown in black.

famous as producing some of the finest wool in Australia. *Portland*, on the coast, is of interest as having been as early as 1834 the site of the settlement of the Hentys.

The Otway and Gippsland Hills.—These low hills attract a heavier rainfall than the Great Valley to the north, and are largely forested. Dairy-farming is increasing in importance, and there are numerous butter factories. On the Gippsland Hills the main centres are Korumburra and Alberton.

TASMANIA

Physically Tasmania is a continuation of the Eastern Highlands, and is thus comparable in some ways with a fragment of the highland regions of New South Wales or Victoria. In climate, however, Tasmania is distinct from any region on the mainland. Apart from the moderating influence on temperature exerted by the sea all round, Tasmania is further south and so cooler on the whole than any part of the mainland. Moreover, it lies entirely within the

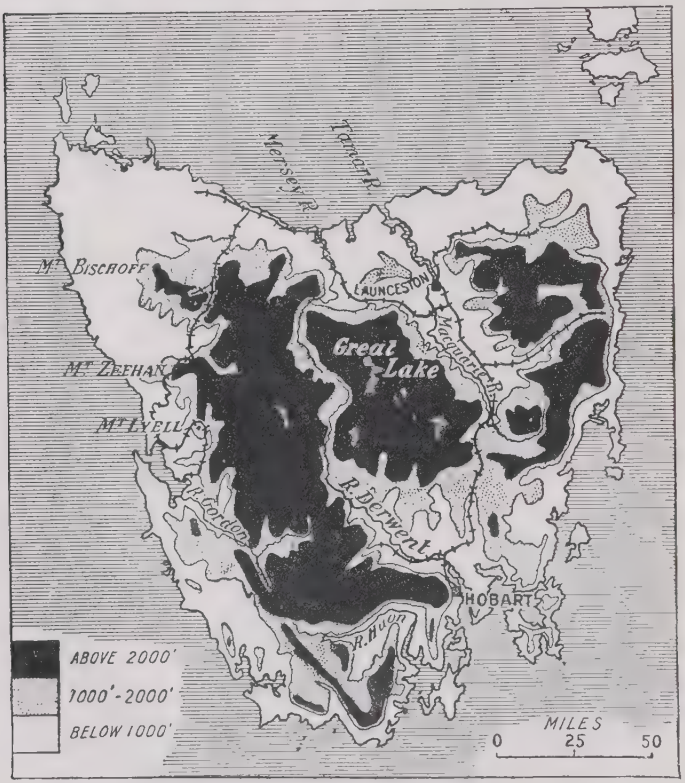

Fig. 61.—Tasmania.

Westerly Wind belt, and as a result has a good rainfall well distributed throughout the year.

Tasmania is about 200 miles from north to south, and 200 miles from east to west. Bass Strait separating it from the mainland is 150 miles wide, but is only shallow.

Geologically Tasmania resembles Victoria or the highlands of New South Wales, and consists of old, hard, sedimentary rocks

penetrated by granite masses. The latter give rise to the main mountain ranges, and with them are associated the famous mining areas of Mount Lyell, Mount Bischoff, and Mount Zeehan. The chief mountain block, with peaks rising to 5,000 feet, lies in the north-west. To the east of this lies the remarkable central plateau, nearly all over 3,000 feet above sea-level. It has been deeply dissected by the Derwent and its tributaries, and isolated portions give rise to the mountainous area of the south-west. By far the most important parts of the island are the larger river valleys and coastal lowlands lying in the eastern half.

On the whole Tasmania is higher and more rugged on the west than on the east (though the highest point, Legge's Peak, is actually on the north-east). Since the prevailing winds are westerly, there is a heavy rainfall on the west and a much lower rainfall on the east, under the rain shadow of the central plateau. Practically the whole west coast receives 50 or more inches a year, with as much as 100 inches on the west coast range behind Zeehan, but the rainfall of the eastern and central river valleys is as low as 20 inches. Ben Lomond in the north-east receives only 60 inches, in spite of a height of over 5,000 feet. As a result the western mountains are often covered with dense forests of beech and soft-wood conifers, and present an appearance curiously different from that of the remainder of Australia. This western forest country is wild in the extreme and is consequently little developed. In this region occurs the " Horizontal Scrub," which builds up a tangled mass of branches 30 or 40 feet above the ground, so impenetrable that in places the traveller can pass over the top.

Tasmania possesses important copper, silver, lead, gold, and tin mines, while fair coal is obtained at Fingal in the east and other places. Owing to rainfall and soil, Tasmania is pre-eminently an agricultural and fruit-growing country. The island is the third fruit-growing state of the Commonwealth, and shares with Victoria the leading position in the production of apples. In regard to potatoes her crop is second only to that of Victoria. Parts of Tasmania are rather too damp and cold for sheep: the average weight of a fleece is less than in other parts of Australia. But the sheep, living in a more bracing climate, are very healthy, and numbers are sent regularly to the mainland to keep up the strength and health of the flocks there.

A very important development in recent years is that of hydro-electric power installations. In particular the waters of the Great Lake, on the central plateau, are diverted into works a thousand feet lower in the Ouse Valley. The island is so small that the electric energy thus generated can be transmitted to all parts of the island. Tasmania has little coal, but the hydro-electric power available is utilized by various factories—notably large metallurgical works near

Hobart, where Risdon contains very important electrolitic zinc works. Tasmania has great possibilities in extending her water-power in manufacture and transport. Some 90,000 horse-power is now being used and much more is thought to be available.

The capital cost of water-power plant, inclusive of distribution plant, at present in operation in Tasmania is not exactly known, but is over £3,500,000, or £16 per head of population.

The population of Tasmania numbers some 214,000. Owing to the mountainous nature of the country it is densest on the narrow coastal lowlands or in the valleys of the principal rivers, especially in the less rugged east. There are, however, important population groups in the western mining areas. Owing once more to the character of the country the population is more scattered than in the mainland states.

Hobart (56,000 in 1925), the capital, is situated on the excellent natural harbour formed by the inlet of the Derwent, which makes it the port of a flourishing fruit and hop-growing district. It is also increasing in importance as a manufacturing centre. *Launceston* (27,000 in 1925), the most important town in the north, is about half the size of Hobart. It stands at the head of navigation on the Tamar, possesses a rich agricultural and pastoral hinterland, and commands most of the trade with Victoria.

SOUTH AUSTRALIA

South Australia is divided by its physical features into a number of distinct regions.

(1) The south-east lies in the lower part of the Murray Basin.

(2) The South Australian Highlands, comprising the Mount Lofty Range in the south and the higher Flinders Range in the north. Kangaroo Island is a southern continuation of the Highlands.

(3) The Great Rift Valley, which contains Spencer Gulf, St. Vincent Gulf, Yorke Peninsula, Lake Torrens, and important and fertile plains such as the Adelaide Plains.

(4) The north-east, which lies in the Lake Eyre Basin of inland drainage, and forms a part of the Great Artesian Basin.

(5) The west and north-west, which forms part of the Great Australian Plateau. In the south this region passes gradually into lower ground, in the west to the Nullarbor Plain, in the east into Eyre's Peninsula.

The chief physical features of South Australia—the younger mountains, the Great Rift Valley, and the lower course of the Murray River—run from north to south, but the older mountains of the north and the very important rainfall lines run from west to east.

Nearly all the population and agricultural development are concentrated to the south of the 10-inch rainfall line.

The Murray Basin.—The last 400 miles of the course of the Murray are in South Australia, but all the water in the river is received from New South Wales and Victoria. Although in times of drought the river may become so shallow that a man may wade across, the lower Murray is usually deep enough for continuous navigation by river steamers. In times of flood the stream overflows its banks and gives rise to shallow lagoons and billabongs.

Fig. 62.—The natural regions of South Australia.
The South Australian Highlands are darkly shaded

In order to regulate the flow the Lake Victoria storage scheme has been devised, and nine locks are in course of construction. The waters of the lower Murray yield large numbers of fish, especially the Murray cod, but the main use of the river is for irrigation. The flood plains are, if necessary, levelled and the water pumped up from the river. Oranges, grapes, and deciduous fruits are the principal products of the irrigated gardens. Wine is also made. The largest irrigation settlement is at Renmark, but others are rising at Moorook, Berri, Waikerie, Cobdogla, and Ral-Ral. The last named will comprise 100,000 acres. In the lower course of the

river, below the bend town of Morgan, old swamps have been drained and afford rich land for vegetable gardens and cow pastures. The river boats are fitted with cold storage for milk transport. The river steamer service has greatly declined with the coming of the more speedy railways, which have tapped the stream at Morgan, Murray Bridge, and other places. The locking scheme, however, provides for the needs of navigation. Although a sand-bar hinders access from Lake Alexandrina and the river to the ocean, it is hoped eventually to construct a canal to some harbour on the coast. The artesian water available in the basin is used mainly for watering stock.

In the extreme south-east of South Australia lies the beautiful Mount Gambier, an isolated extinct volcano. Here volcanic soils cover the limestone plains for an area of some twenty-five square miles, making a fertile pocket well suited to vegetables. The remainder of the region is important for sheep, but wheat-growing is increasing in many places. The mallee lands south of the Murray, for instance, are now producing over 2,000,000 bushels of wheat per annum. Loxton and Pinnaroo are thriving wheat centres.

The South Australian Highlands.—The Central Highlands and the rift valley of South Australia have been formed by earth movements crushing the strata against the West Australian stable massif of old rocks. The hills of the South Central Highlands, including the Mount Lofty Range, although they rarely attain a height of 2,000 feet, attract a heavier rainfall than the surrounding lowlands. There are many beautiful forested slopes, from which firewood as well as timber for mines and for sleepers is obtained. The principal trees are the red gums and the stringy barks, but pines grow well when planted. Fruits—especially the vine—flourish on the cleared hillsides with a western aspect and a rainfall of about 25 inches. South Australia possesses nearly half the vine acreage in the Commonwealth, and produces over 80 per cent. of Australia's wine, largely in this region. Olive trees are grown and olive-oil is produced. The rich soil in the valleys is planted with vegetables, and many sheep are reared. Dairy-farming and the production of butter and cheese are important. The rain-water of the highlands is impounded in a number of reservoirs. The highest peak of the Mount Lofty Range is Mount Lofty itself (2,334 feet) just to the east of Adelaide. Further north the ranges open out and the rainfall is less. Here are broad fields devoted to wheat and mixed farming. Large numbers of sheep and cattle also flourish. The famous Burra and Kapunda copper mines were in this region. Further north, commencing about Port Pirie, are the Flinders Ranges. These ranges, though of greater altitude, are drier than the Mount Lofty group of hills, but are still of sufficient altitude to attract a larger rainfall than the surrounding plains. Notice how the 10-inch

rainfall line curves northwards so as to include these hills. The gum trees grow mainly near the streams and, though smaller than in the southern group of hills, furnish useful wood. Both wheat

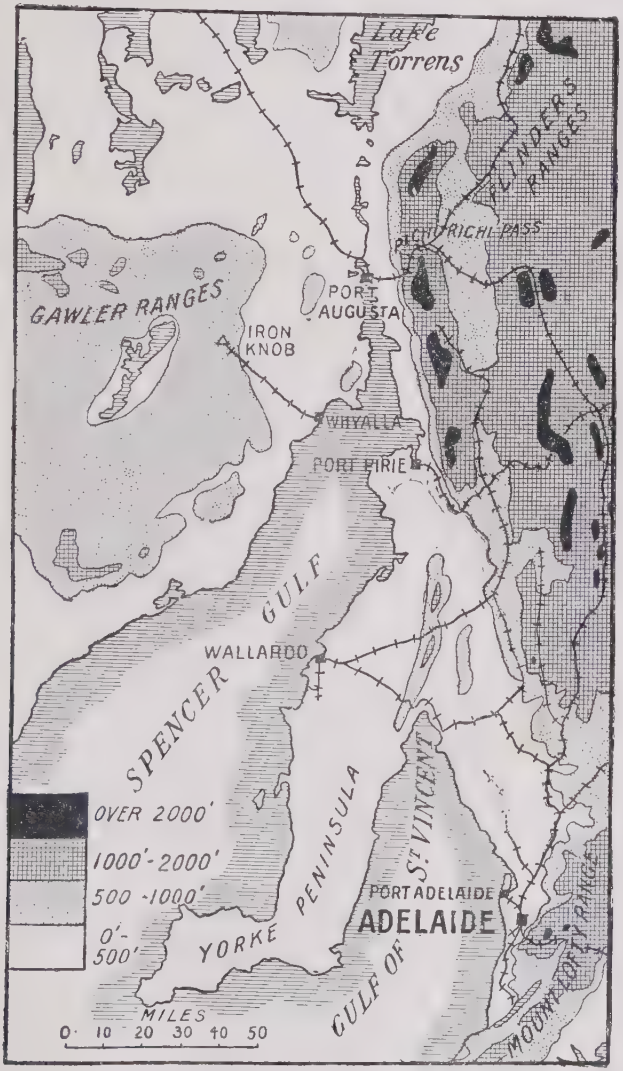

FIG. 63.—The South Australian rift valley.

and stock are important. The main railway from Adelaide to Port Augusta crosses the Flinders Range by the beautiful Pichi Richi Pass. Amongst the higher peaks are St. Mary's Peak, Mount Brown and Mount Remarkable, all just over 3,000 feet. A branch of the

main Flinders Range connects up with the famous Broken Hill District of New South Wales.

The Great Rift Valley.—The plains which lie along the Great Rift Valley to the west of the Central Highlands possess no general name but cover a considerable area—from Adelaide in the south to the neighbourhood of Lake Torrens in the north—and include Yorke Peninsula. The southern part of the plains, where the rainfall is more than 10 inches a year, constitutes the most important part of South Australia, and here the majority of the people live. This is the great wheat-growing region as well as the

FIG. 64.—The distribution of wheat in South Australia.
The ten-inch rainfall line roughly delimits the wheatlands.

leading sheep-farming area. There are numbers of vineyards in areas of fair rainfall, especially near the Mount Lofty foothills.

Adelaide (with suburbs 304,000 in 1925), the State capital, lies in the south of this region. It was founded by Colonel Light in 1836–37, and the fine plan of the present-day city is largely the result of his forethought. The city is built on two low plateaus on either side of the River Torrens, and is divided into North and South Adelaide. The existence of the Torrens Valley makes drainage an easy matter, whilst the rainfall of the highlands supplies ample water through the reservoirs in the Mount Lofty Ranges near by. Port Adelaide was originally built on the banks of the well-sheltered Port River estuary, but the increasing size of ships has rendered necessary the construction of an outer harbour. Large manufacturing districts have grown up on the plains between the city and harbour, and many industries are carried on near the water front.

Wallaroo is increasing in importance as a wheat and wool port, and manufactures chemical fertilisers. *Port Pirie* (10,000), the second port of the State, owes its growth to the Broken Hill mines 250 miles away. It smelts and exports silver, lead, and zinc, and imports coal (from New South Wales) and merchandise for Broken Hill, but it is also increasing as an export centre for wheat and wool. On the shore of Spencer Gulf opposite to Port Pirie is Whyalla, the port of the Iron Knob mines, whence iron ore is shipped to Newcastle in New South Wales. *Port Augusta*, at the head of Spencer Gulf, is the starting-point for the Trans-Continental Railways. It has a fine harbour, and ships wheat and wool. The other towns of the plains are mainly agricultural centres, but the salt industry of Yorketown in the Yorke Peninsula should be noted.

The shallow Lake Torrens area in the north of the Rift Valley receives a very low rainfall. Pasturing is the only industry of importance.

The Lake Eyre Basin.—The Lake Eyre Basin of inland drainage is an arid undeveloped region. During the occasional years of good rainfall numbers of sheep could be supported, but as there is no means of escaping the inevitable years of drought and heat, the number of sheep and cattle pastured is not very great, and sheep-runs formed under temporarily favourable conditions have been deserted. Much of the Lake Eyre Basin lies in the Great Artesian Region, and the artesian water is used to keep open the important stock routes. The railway to Oodnadatta runs along the southern and eastern margins of the Lake Eyre Basin, but the iron road with its fortnightly train has not resulted in any extensive settlement.

The Western Plateau.—A third of South Australia—the north-west—forms part of the arid plateau of Western Australia. The plateau region is devoid of white inhabitants, except along the southern and eastern margins, where a few cattle are raised and sheep are increasing in numbers with the sinking of bores and the construction of dog-proof fences. Opal is found in Stuart's Range. To the south-west lies the treeless limestone plain known as the Nullarbor Plain. To the south-east the plateau passes gradually into the salt-lake region round Lake Gairdner and then gives place to the low sandy hills of the Gawler Ranges, composed of ancient granitic rocks. South of the Gawler Ranges lie Eyre's Peninsula and a strip of coastal lowlands, which as far west as Fowler's Bay possess a rainfall of from 12 to 25 inches, a rainfall which is, in addition, comparatively regular. With the advent of scientific farming this region is becoming a great wheat and sheep country, with Port Lincoln as the chief port. The famous Iron Knob, with its port Whyalla, lies to the north-east of the Peninsula. Eyre's Peninsula and the west coast are a region of great promise.

WESTERN AUSTRALIA

Western Australia is by far the largest of the States, and occupies a third of the whole continent. With the exception of the Northern Territory it is perhaps the least developed of the States, but the one in which immediate progress is most to be expected. About a third of this huge area lies in the tropics; about two-thirds in the temperate zone.

Topographically the whole belongs to the great Western Plateau, and it is only possible to separate a narrow coastal strip down the west coast.

Geologically the plateau, as already explained, consists of a mass of old crystalline rocks in the south, and of a complicated series of very old sedimentary rocks in the north. In the south-east the Nullarbor Plains consist of a nearly horizontal limestone covering the old rocks.

Climatologically the north-west coast has a tropical climate with a monsoonal rainfall; the south-west is a typical Mediterranean region. In both cases the rainfall decreases inland as one approaches the arid interior.

In a very broad sense Western Australia falls into three natural regions, which are defined by rainfall rather than by topography:

(*a*) The Tropical Lands of the north and north-west.
(*b*) The Mediterranean Regions of the south-west.
(*c*) The Dry Lands of the interior.

The Tropical Lands of the North and West.—The whole area corresponds roughly with the Tropical Grasslands or Savana. Along the wetter north is a belt of savana woodland, where trees are more abundant. Practically the whole region has more than 10 inches of rainfall a year, and along the north coast it is locally more than 50 inches.

The savana and savana woodland afford good cattle country. The drowned coastline provides excellent harbours, and the recent establishment of meat-chilling works at Wyndham marks an important step in development. Other outlets of the country are the small ports of Derby (on the Fitzroy River) and Broome. The position of artesian basins awaiting development should be noted.

The Mediterranean Region (**"Swanland"**).—Along the west coast is a coastal strip enjoying a good winter rainfall. This falls into two parts:

(1) The Perth Region, which consists of recent sands and limestones and has an underlying artesian basin giving a good water supply. The natural vegetation is Tuart Forest, but amongst the sandhills are numerous swamps. These, when drained, afford excellent agricultural land—especially for

vegetables—and magnificent dairy pastures. Towards the scarp of the plateau the fertile soils are excellent for the growth of vineyards, and considerable quantities of wine are produced. A more recent development is citrus-fruit farming.

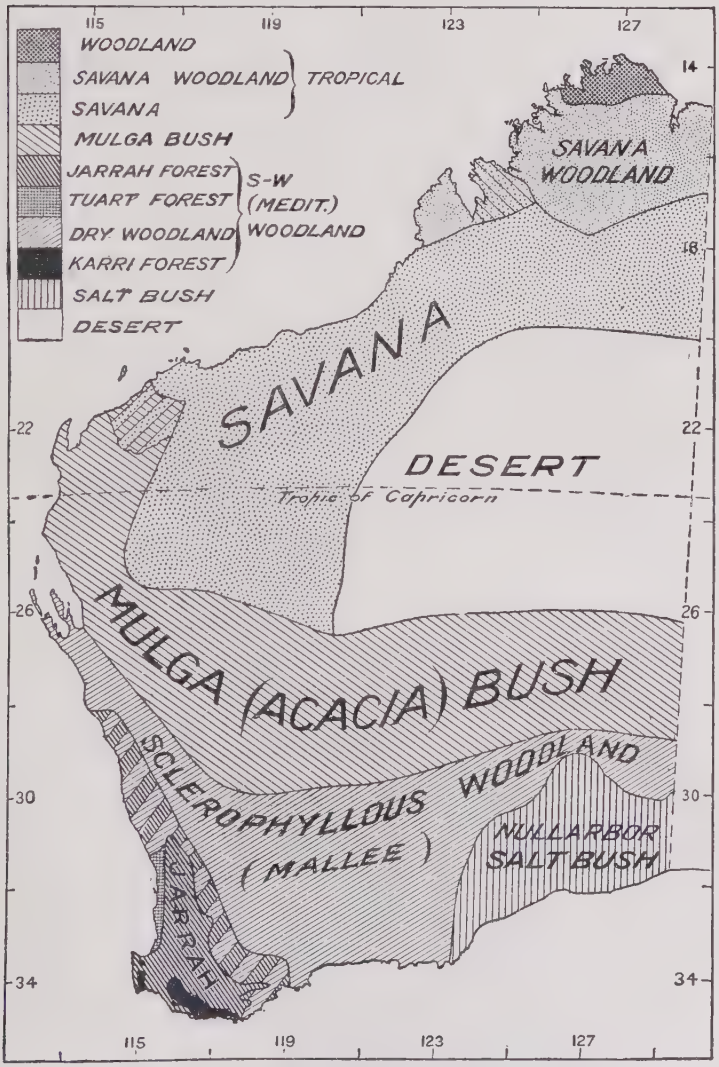

Fig. 65.—The natural vegetation of Western Australia.
From a map specially prepared by Mr. C. A. Gardner, Dept. of Agriculture, Perth, 1926.

Perth (180,000 in 1925), the capital of Western Australia, lies in this region, beautifully situated on the broad shallow Swan River.

At the mouth of the river lies *Fremantle*, the chief port. *Bunbury*, at the southern end of the region, is a small port for timber and other produce.

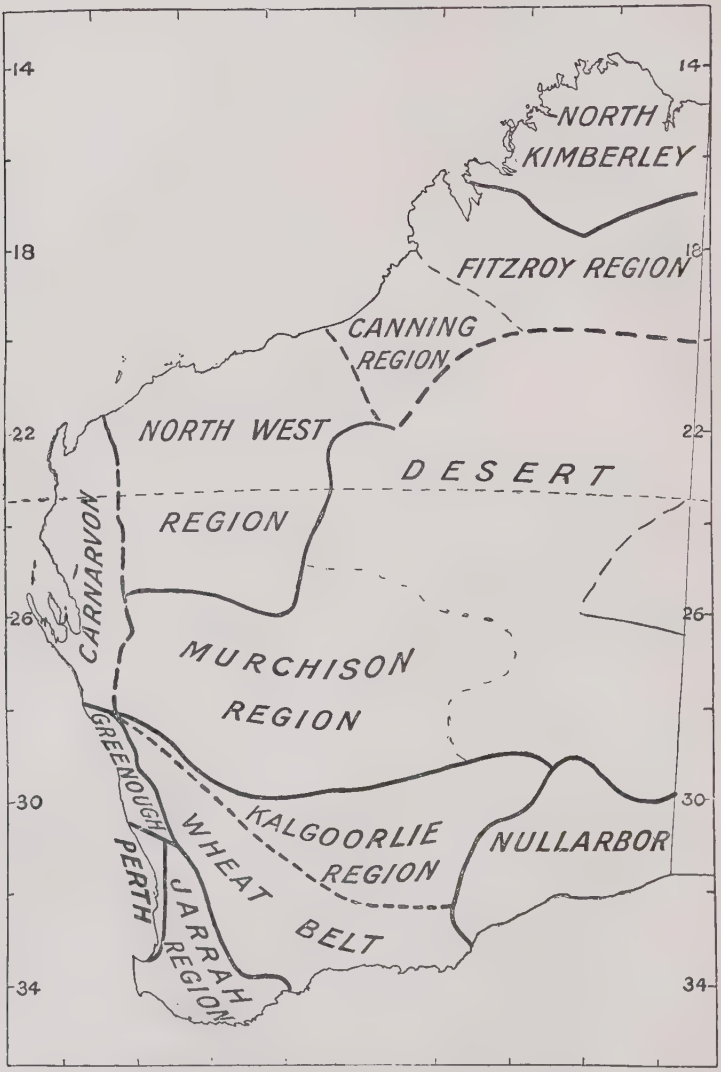

Fig. 66.—The natural regions of Western Australia.
Slightly modified from E. de C. Clarke (*Journ. Roy. Soc. W.A.*, Vol. XII., 1926).

(2) The Greenough Region, to the north of the Perth Region, has a rainfall of 15–20 inches, and is therefore suited to wheat. *Geraldton* is the port of this region.

On the plateau itself in the Mediterranean climatic belt lie two regions :

(3) The Jarrah Region, with a rainfall of more than 25 inches, is so called because it is the home of the jarrah forests. In the wettest parts of the south-west are the fine karri forests (rainfall 40 inches). Much of the country is suited to fruit orchards and dairy-farming. The region is bounded on the west by the Darling Fault scarp. *Albany*, occupying a fine position on King George Sound, lies to the south-east of the region, but also serves the Wheat Belt.

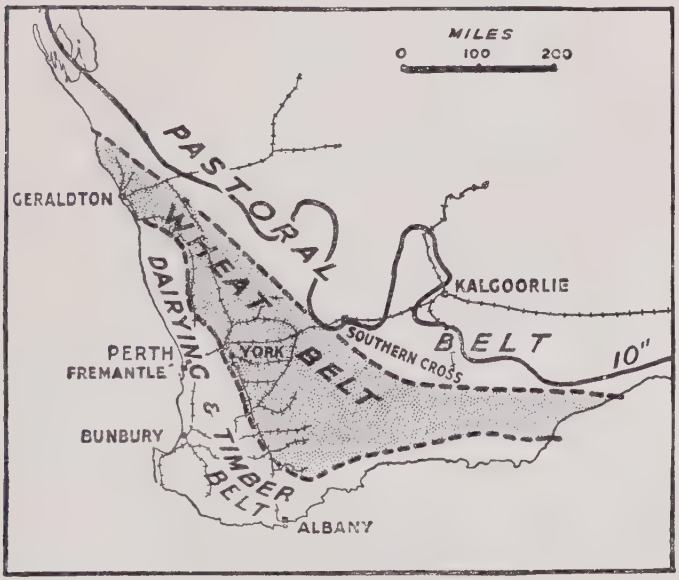

Fig. 67.—Swanland.

(4) The Wheat Belt occupies a strip of the plateau having a rainfall of between 10 and 25 inches. The growing of wheat has spread rapidly in recent years, and is capable of much greater development. The belt is well served by railways. *York* is an important centre. To the east, where the country is a little dry for wheat, sheep-farming is the leading occupation, but wheat is gradually pushing into the pastoral belt, as at Southern Cross.

The Dry Interior.—The Kalgoorlie Region, rendered famous by the gold fields of Kalgoorlie, is marked off from the wheat belt merely by decrease in rainfall. *Kalgoorlie* (5,000 in 1925) has now another importance as a railway junction, with a break of gauge.

The Nullarbor Plain, of horizontal Tertiary limestone, is covered

are many beautiful glaciers. The Franz Josef Glacier descends to within 700 feet of sea-level. The Southern Alps lie much nearer the west coast than the east; in the south-west the mountains approach the coast, and there is a stretch of magnificent fiord country:

Fig. 69.—Physical map of New Zealand.

further north the narrow coastal plain of Westland separates the mountains from the sea.

In the North Island, the main chain does not exceed 6,000 feet in height, and lies nearer the east coast. West of the main chain, three magnificent volcanoes tower to greater height, and a fourth,

Mount Egmont, stands by itself in the south-west of the North Island and rises to 8,260 feet.

On the basis of its physical features New Zealand may be divided into a number of broad physiographic regions :

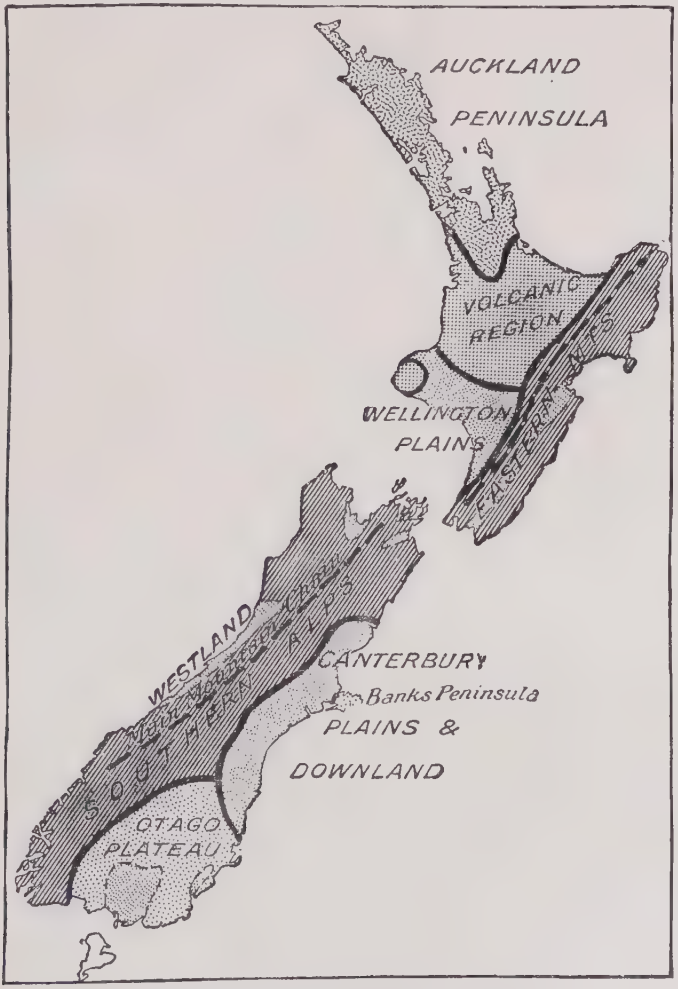

FIG. 70.—The main physical regions of New Zealand.
The more important plains which lie amongst the mountain or plateau lands are separately shown.

NORTH ISLAND.

(*a*) *The Eastern Mountain Ranges.*—There is not one single range, but a series, and foothills occur all along the east coast except where interrupted by the broad Hawke's Bay.

(*b*) *The Volcanic Region.*—This surrounds Lake Taupo and stretches northwards to the Bay of Plenty. To the south this region merges into the fertile

(*c*) *Wellington Plains.*

(*d*) *The Auckland Peninsula.*—This area occupies the north of the island, and is mainly lowland.

SOUTH ISLAND.

(*a*) *The Southern Alps.*—With their foothills and subsidiary ranges, these mountains occupy well over half the island. The main range of the Southern Alps stops abruptly at Cook Strait, and is not continued into the North Island. It is a subsidiary eastern range to the Southern Alps which crosses the strait.

(*b*) *The Otago Plateau.*—This large dissected plateau of ancient rocks occupies the south of the island.

(*c*) *The Canterbury Plains and Downland.*—The Canterbury Plains form a well-marked lowland region, 150 miles from north to south along the coast. With the plains may be included the hilly Banks Peninsula, largely of volcanic origin. Surrounding the plains and separating them from the Southern Alps are large stretches of undulating country or " downland."

The rivers of New Zealand, especially in the mountainous South Island, are swift streams more suitable for the generation of power than for navigation. In the South Island, the longer ones naturally flow to the east coast. In the North Island the Waikato and certain others are navigable by small steamers but, like the Australian rivers, have sand-blocked mouths. Recent subsidence in the north of the island has resulted in the drowning of the river mouths, some of which afford excellent harbours.

Geology.—Geologically the Dominion of New Zealand resembles England in containing small " samples " of rocks of most of the geological ages. Physical features depend to a marked degree on geological structure. In the South Island the Southern Alps consist of highly folded rocks of varying age ; the fiord country and Otago Plateau of ancient metamorphic rocks ; the downland and low hills mainly of beds of soft sandstone and limestone ; the larger plains, notably the Canterbury Plains, are of comparatively recent formation and consist of sheets of gravel—in some cases largely of glacial origin. In the North Island, the mountain ranges of old folded rocks are of more limited extent. Remnants of other fold ranges occur in North Auckland and the gold-bearing country of the Colville Peninsula. The dominant feature of the North Island is the volcanic country in the heart of the island and stretching northwards to the Bay of Plenty. Much of the surface is covered with pumice and is largely barren. East of the main fold ranges

are younger rocks, and there are numerous though small gravel plains. Sand dunes cover large areas near the west coast, especially in North Auckland.

Minerals.—Although small quantities of many minerals occur

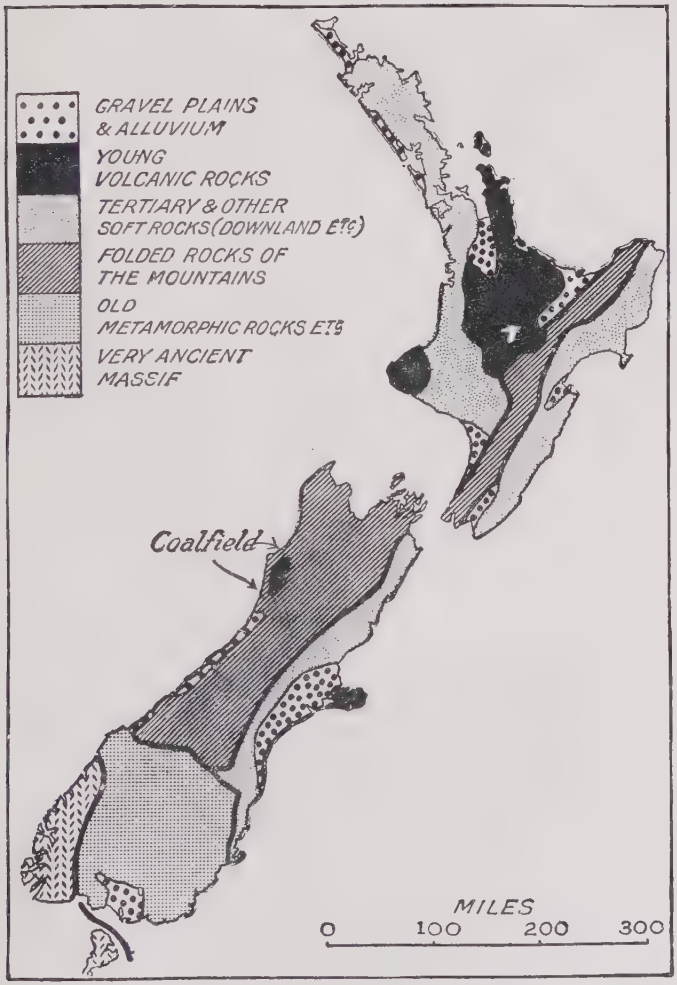

FIG. 71.—Simplified geological map of New Zealand.

widely scattered in New Zealand, only two or three are of commercial importance.

Gold.—As in Australia, the discovery of gold in New Zealand contributed greatly to the progress and settlement of the country, but the production has been declining for a number of years. From

1853 to the end of 1924, gold to the value of £91,400,000 has been obtained, but in 1927 the output was only £550,000. The production is mainly from lodes, as in the Cape Colville Peninsula, and from dredging operations in the beds of deep streams. Most of the gold from the quartz lodes contains a proportion of *silver*.

Coal.—New Zealand has several small fields of bituminous coal, notably around Greymouth and Westport on the west coast, and some extensive fields of lignite. The present output of about 2,000,000 tons is not quite enough for home consumption.

Iron Ore.—Extensive deposits of iron ore occur in Nelson Province and elsewhere, and a start has been made with smelting at Onakaka.

Kauri-gum.—The fossil gum is dug from the soils of former kauri forests in Auckland Province. To the end of 1924 the total value of the gum exported was £21,000,000. In 1927 4,674 tons were exported, worth £280,000.

Among other minerals may be mentioned New Zealand jade, phosphates, and sulphur.

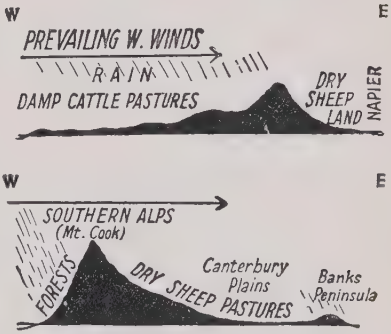

FIG. 72.—Sections across the North Island and South Island of New Zealand.

Water-power.—With a mountainous surface and a good and regular rainfall, and many rivers naturally regulated by lakes, New Zealand has exceptional resources of water power. It is estimated that 775,000 H.P. could be easily developed in the North Island, and over 4,000,000 H.P. in the South Island. At present about 70,000–80,000 H.P. is actually developed. The Lake Coleridge works supply Christchurch and Lyttelton; the Waikato River is used to supply Cambridge, Hamilton and district; and the Mangahoe Power Scheme supplies Wellington and a large area.

Climate.—Generally speaking, New Zealand has a mild and equable climate of the Cool Temperate Oceanic or North-West European type. See the graphs and figures for Dunedin, which may be considered typical of the colder parts, on pp. 20 and 80. The northern part of the North Island lies in the same latitudes as Mediterranean lands. It is too much influenced by the sea to have a typical Mediterranean climate, but there is a marked winter rainfall maximum, and a temperature ranging from 50° to 70°. Since the prevailing winds throughout New Zealand are from the west, the east is always the drier side—as shown in Figs. 72 and 79. The climate of the drier eastern coasts is more continental in character; at Christchurch the range of temperature is 20°;

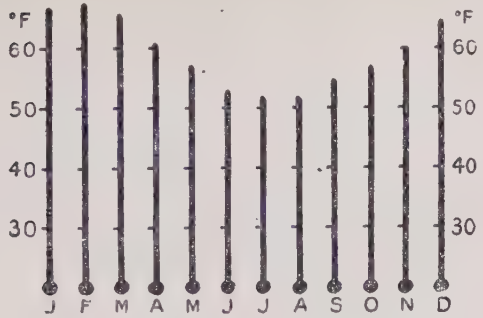

FIG. 73.—Temperature graph of Auckland—typical of the warmer parts of the North Island.

Contrast this with Dunedin (Fig. 77).

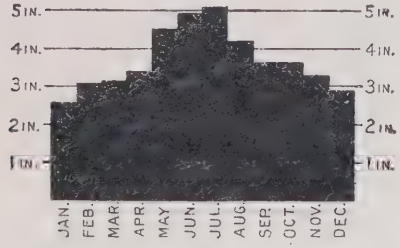

FIG. 74.—Rainfall graph of Auckland.

Note the marked winter maximum. But the summer months are not very dry, as they would be in typical Mediterranean lands.

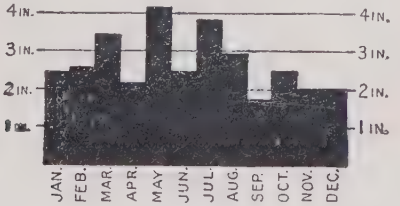

FIG. 75.—Rainfall graph of Napier.

FIG. 76.—Rainfall graph of Christchurch—typically well distributed through the year.

Christchurch and Napier are typical of the drier eastern side of New Zealand.

Fig. 77.—Temperature graph of Dunedin—typical of the colder parts of the South Island.

Contrast this with Auckland (Fig. 73).

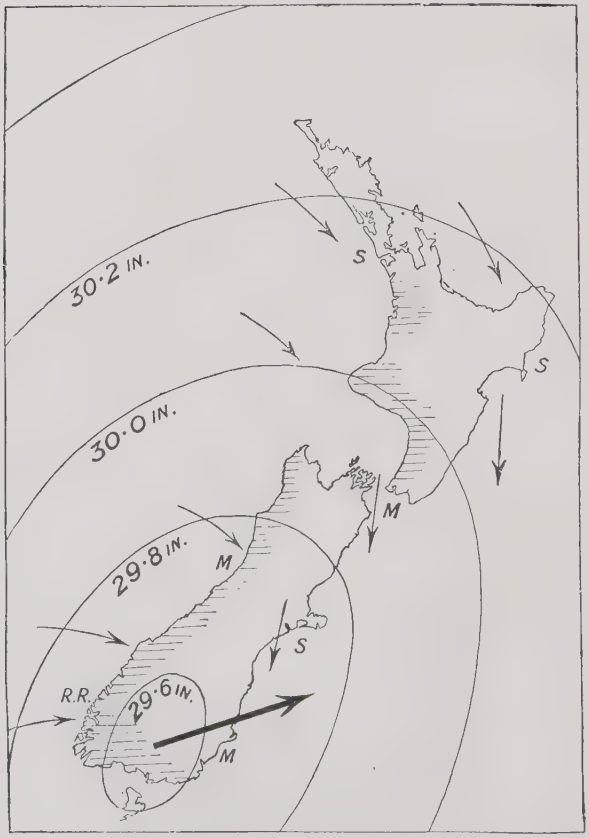

Fig. 78.—A typical cyclone over New Zealand.

Rain is falling in the lined areas. The large arrow shows the direction in which the system is moving. Letters refer to the state of the sea. R.R.=rather rough; M=moderate; S=smooth.

frosts may occur for nine months, but summer temperatures of 90° are common. In most regions the climate is bright and sunny, and such situations as the shores of Tasman's Gulf enjoy a particularly sheltered and pleasant climate.

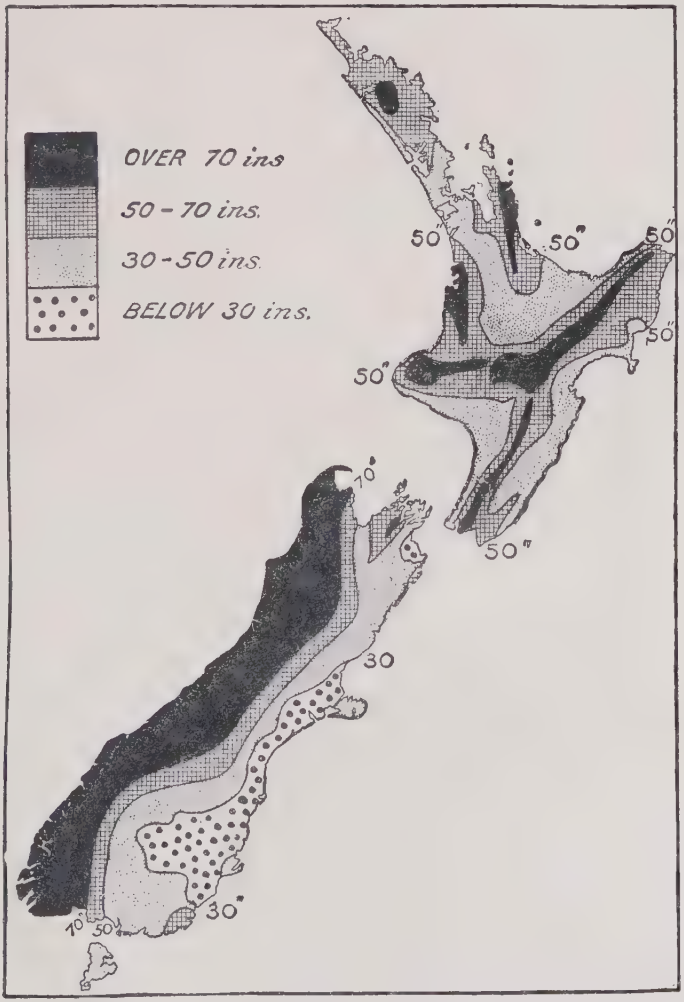

Fig. 79.—Rainfall map of New Zealand.
Notice that no part of the Dominion is really dry. Contrast Australia.

Natural Vegetation.—New Zealand has a rich and varied vegetation. Temperate Forests, evergreen in the wetter regions and almost sub-tropical in character, form the typical vegetation of lowlands and lower slopes of the mountains. It is in these forests

that are found the numerous ferns and tree ferns which have made the forest scenery of New Zealand world famous for its beauty. Mountain forests, consisting largely of the southern beech, may extend also to the lowlands. Grassland with tussocks of grass is common on the volcanic plateau of the North Island, and on the eastern plains of the South Island.

Forests.—Nearly a fifth of New Zealand is forested, and of this 5,500,000 acres may be described as forest land with marketable timber. There is now very little of the famous kauri left; the principal softwoods are now rimu and kahikatea. New Zealand is fortunate in having also hardwoods and there are large reserves of beech.

Agriculture.—A fifth of New Zealand is forested; two-thirds is suitable for agriculture and grazing. Out of a total area of 66,400,000 acres, 18,500,000 acres are under "cultivation" but no less than 16,600,000 acres of this are "sown grasses." The area under grain and pulse crops (excluding crops grown for hay) is less than 400,000 acres. It will be seen at once that New Zealand is a pastoral rather than an agricultural country. Excluding hay, fodder, and turnips, wheat and oats are the only crops covering more than 100,000 acres. Wheat is grown in the Canterbury Plains, oats in the Canterbury Plains, Otago, and the North Island. *Phormium tenax*, or New Zealand flax, a fibre largely used for rope-making, etc., is obtained from a plant growing wild in damp places, but also planted artificially, especially in Wellington Province. About 28,000 acres are occupied by *orchards*, especially in North Auckland, Nelson, Otago, Canterbury, and Hawke's Bay, and there is considerable export of apples. The vine will only grow in the warmer regions of the North Island. The large area under sown grasses is due to the fact that English grasses thrive, and afford better food for sheep and cattle than the native grasses.

Pastoral Industries.—The following table shows the number of animals in New Zealand in 1926:

Horses	315,000
Cattle	3,500,000
Sheep	25,000,000
Pigs	500,000

Horses.—Though still widely used for draught purposes and farm work, it is interesting to note the decline in the number of horses since 1911, largely owing to the increased use of motor-cars and mechanical farm implements.

Cattle.—Formerly principal attention was paid to the rearing of cattle for beef and the development of the beef export trade. The average number of cattle killed for meat during the years 1916–25 was 370,000 per year, yielding 2,670,000 cwt. of meat, of which 758,000 cwt. were exported. Of recent years it is the rise

of the dairy-farming industry which has been mainly responsible for the increase in the number of cattle. There is now a marked tendency amongst farmers to keep fewer but better cows, and to grow special fodder crops, so as to induce the cows to give more and better milk. Milking machines are widely used in New Zealand, and have effected a great saving in wages for the farmer. Amongst the New Zealand cattle are found all the best breeds of England, but the most numerous are cross-breds in which the predominating strain is the famous Jersey breed. Under the Dairy Industry Act, 1908, the quality of dairy produce is carefully watched by inspectors appointed by the Government, with the result that New Zealand butter and cheese have acquired a high reputation in Europe. Fig. 80 shows the distribution of cattle in New Zealand. More than 80 per cent. of the whole is found in the moist, fertile lands of the North Island. Auckland specializes in the production of butter; Taranaki and Wellington in cheese.

Fig. 80.—The distribution of cattle.

Each dot represents 50,000 cattle in 1925. All land above 2,000 feet shaded. The cattle are all on the lowlands.

Sheep.—A graph illustrating the rise of the principal pastoral industry in New Zealand is given on p. 85 (Fig. 85). There are now about 25,000,000 sheep in the country. Owing to the varied nature of the surface, there are many different breeds, each requiring different conditions. Some regions specialize, as in Australia, in producing fine quality wool; other regions in mutton and lamb for export. On the hills and downs of the South Island the merino sheep (famous for its wool) flourishes; on the Canterbury Plains the famous Corriedale breed of sheep (a cross between a merino and one of the English breeds, Leicester or Lincoln) produces the "Canterbury Lamb," now so well known in England, as well as excellent wool. In the moister North Island the Romney sheep, which comes from

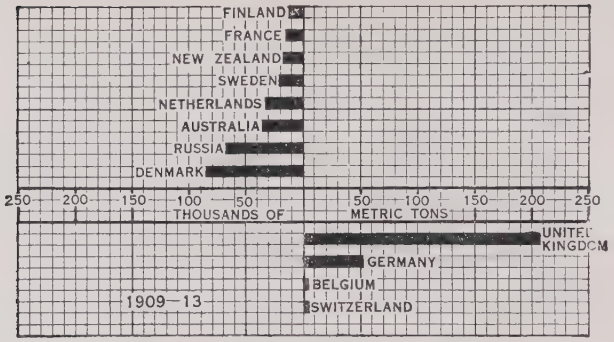

FIG. 81.—World trade in butter, 1909–13.

It should be noted that the international butter trade of the world is directed mainly towards supplying the needs of Great Britain, and, to a less extent, those of Germany.

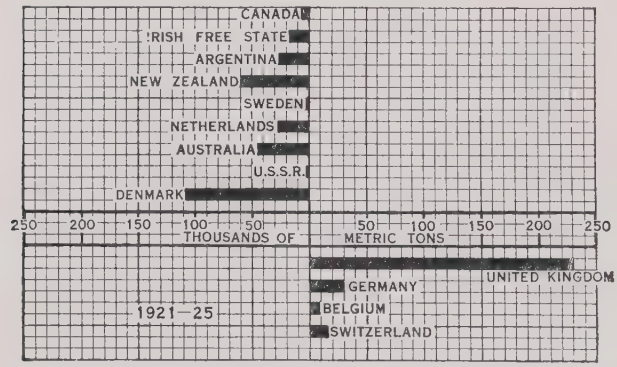

FIG. 82.—World trade in butter, 1921–25.

Notice the rising importance of New Zealand.

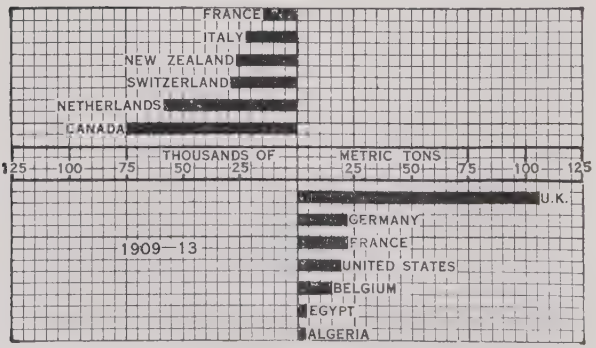

FIG. 83.—World trade in cheese, 1909–13.

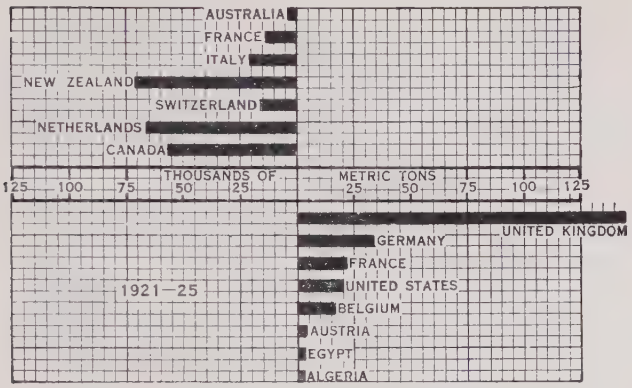

FIG. 84.—World trade in cheese, 1921–25.
Notice the rapidly increasing importance of New Zealand.

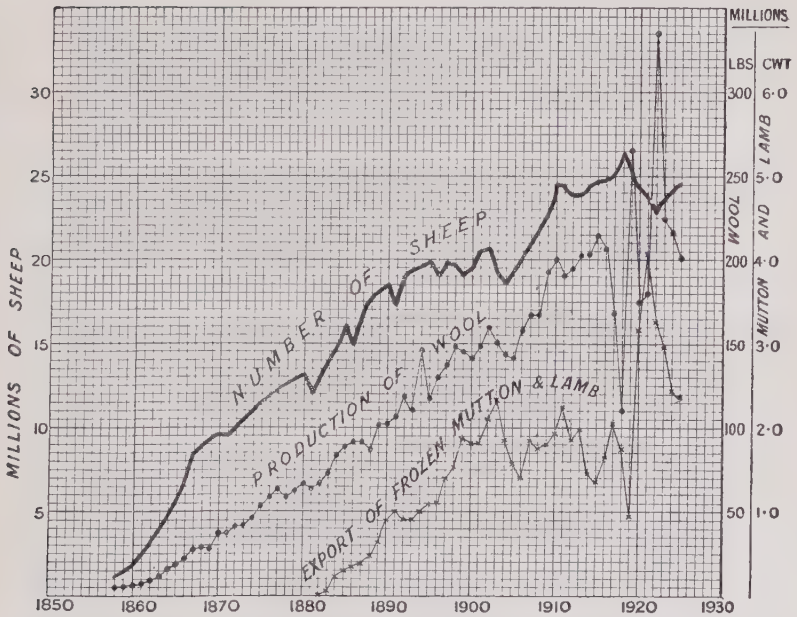

FIG. 85.—Graph showing the production of wool in New Zealand, also number of sheep and export of meat.

A graph typical of the expansion of an agricultural or pastoral industry in a new country. Notice that before the invention of freezing and chilling processes, the wool was the essential produce from the sheep which was exported. In the exports of mutton and lamb New Zealand easily leads the countries of the world. The South American republics —Argentina, Uruguay, and Chile—take second place, followed by Australia. The bulk of the imports are absorbed by Great Britain. The average export of frozen meat from New Zealand in 1921–25 was about 175,000 tons, the bulk of which was mutton and lamb. This represents nearly half the total international trade in the commodity.

the wet Romney Marsh of England, is the favourite sheep. The Southdown sheep produces much of the fat lamb of both islands.

Pigs.—Although there are large numbers of pigs in New Zealand, the pig-breeding industry has not progressed in the same way as the sheep-farming and cattle-farming industries. There are 4,000,000 poultry in New Zealand (1921 census). The dairying lands of the Dominion are well suited to bee-keeping, and honey of excellent quality is produced. About 1,400,000 lbs. of honey are exported annually (1923–28).

Fisheries.—The rich fisheries round the islands are as yet little exploited. The once-important whale fisheries are now of slight significance.

Population.—The colonization of New Zealand really dates from the foundation of Wellington in 1840. The gold rushes of the 'sixties brought large numbers of people to New Zealand, and since then there has been a steady increase both by immigration and by natural increase to 1,344,000 in 1926. The native Maoris numbered 63,000 in 1926.

Fig. 86.—The distribution of sheep in New Zealand.

Each dot represents 100,000 sheep in 1925. The line shown is the 50-inch rainfall line. Notice that nearly all the sheep are found where the rainfall is less than 50 inches per year.

Manufactures.—The population of New Zealand is not yet sufficient to permit the development of a wide range of manufacturing activities, and at present the manufactures are mainly connected with the preparation of raw materials produced in the Dominion. The principal industries are thus meat-freezing and preserving; butter, cheese, and condensed milk making; grain milling, clothing manufacturing, and woollen-milling, saw-milling, brewing, and tanning. Steam as a motive power is being rapidly replaced by electricity.

Communications.—The railways of New Zealand are nearly all state owned, and are on the 3′ 6″ gauge. As shown in Fig. 87

the direction of the railways has been controlled to a marked degree by physical features. The isolation of such centres as Gisborne, Nelson, and Blenheim should be noted, and it will be gathered that coastal steamer services play a large part in the communication system. Great progress has been made in the

FIG. 87.—The railways of New Zealand.
All land over 2,000 feet in black. Only two railways cross this high land.

improvement of roads in New Zealand since the introduction of motor-cars (of which there are over 100,000 in the country). Roads link up places like Gisborne, not yet served by rail, and Napier.

Despite its world-isolation, New Zealand is becoming an

important tourist centre. The variety and accessibility of its scenic attractions and its thermal waters are mainly responsible.

Foreign Trade.—New Zealand enjoys the distinction of having a larger foreign trade per head of population than any other country in the world.

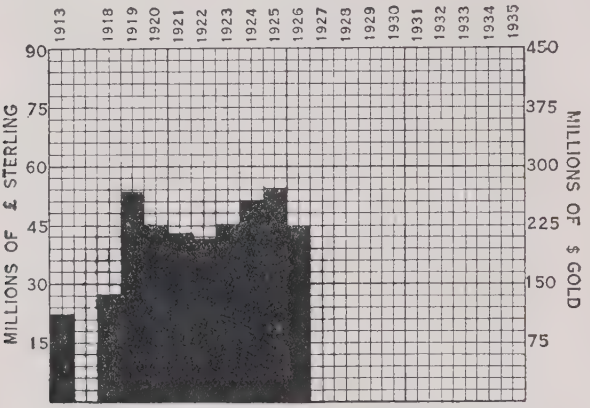

Fig. 88.—The exports of New Zealand (exports of domestic produce—total exports are about £1,000,000 more).

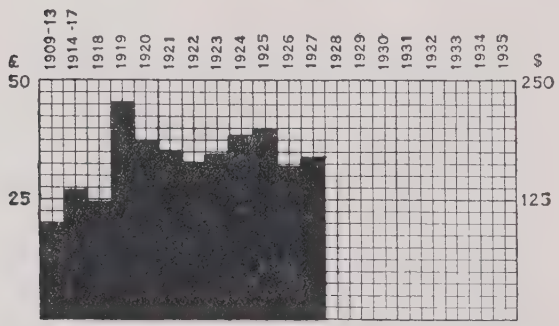

Fig. 89.—The exports of New Zealand—*per capita* value.

Exports.—The growth of the export trade of New Zealand is shown by the following figures :

1900 . .	£13,000,000 or £16 5*s.* ($79·1)	per head of population	
1910 . .	£22,000,000 ,, £21 0*s.* ($102·3)	,,	,,
1920 . .	£45,500,000 ,, £36 15*s.* ($180·0)	,,	,,
1924 . .	£52,000,000 ,, £38 10*s.* ($187·5)	,,	,,
1925 . .	£54,500,000 ,, £39 10*s.* ($192·4)	,,	,,

It must be remembered that the enormous rise from 1910 to 1924 is in part due to increase in prices. Exports in 1924 were £24,000,000 or £17 15*s.* ($86·4) per head, calculated at 1900 prices. Fig. 88 shows the rise in value in exports in recent years, Fig. 89

shows the rise expressed in terms of *per capita* value. The next diagram shows the leading items in the export trade. It will be seen that the wealth of New Zealand depends almost entirely on her dairying and sheep-farming industries. In 1926 the proportions by value were: wool, 26·1 per cent.; butter, 19·2 per cent.; meat, 19·1 per cent.; cheese, 13·1 per cent. Other items, in order of importance, are sheep-skins, 3·4 per cent.; hides, 1·8 per cent.; tallow, 1·6 per

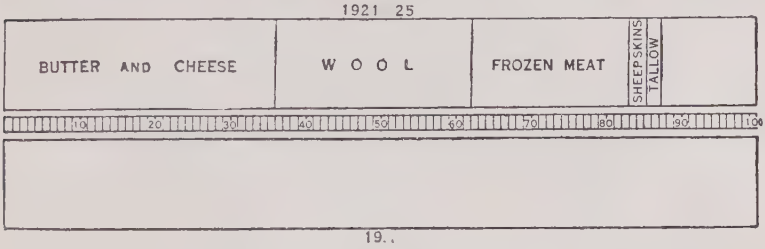

FIG. 90.—The exports of New Zealand.

In addition to those enumerated, hides (1·5 per cent.); rabbit skins (1·5 per cent.); kauri gum (1·0 per cent.); timber (1 per cent.); gold (1 per cent.); and phormium fibre (less than 1 per cent.) may be noted; but the diagram stresses the dependence of New Zealand's prosperity on sheep and dairy farming.

cent.; rabbit skins, 1·8 per cent.; all connected with the pastoral industries. Gold represented in 1926, 1·1 per cent.; timber, 1·1 per cent.; phormium fibre, 1·3 per cent.

Imports.—In normal years the value of imports is considerably less than that of exports:

1910 . .	£17,000,000 or £16 7*s.* 9*d.*	($79·8)	per head of population
1921 . .	£43,000,000 ,, £33 12*s.* 9*d.*	($163·8)	,, ,,
1924 . .	£48,500,000 ,, £35 17*s.* 6*d.*	($174·7)	,, ,,
1925 . .	£52,500,000 ,, £37 17*s.* 10*d.*	($184·5)	,, ,,

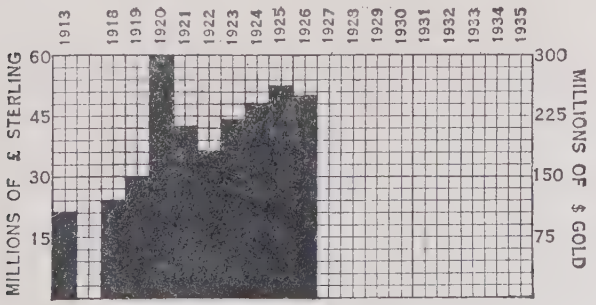

FIG. 91.—The imports of New Zealand.

Fig. 91 shows the rise in value of imports in recent years, Fig. 92 the rise expressed in *per capita* value. As shown in Fig. 93 the imports are far more varied than the exports, but manufactured goods easily predominate. In the diagram "iron and

steel manufactures" include motor-cars (10·4 per cent. in 1926); machinery (7·5 per cent.); iron and steel (4·8 per cent); implements (1·4 per cent.); and hardware (2·3 per cent.). Among other

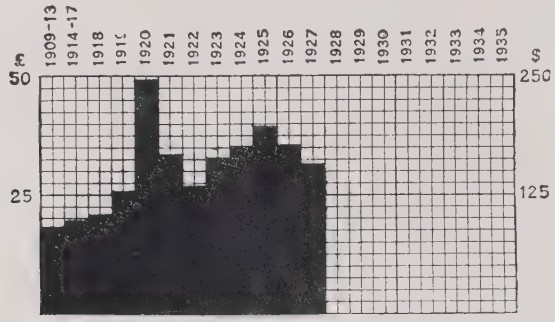

FIG. 92.—The imports of New Zealand—*per capita* value.

imports shown roughly in the diagram may be noted, in order of value in 1926, drugs (2·3 per cent.); boots and shoes (2·0 per cent.); timber (1·7 per cent.); tobacco (0·3 per cent.).

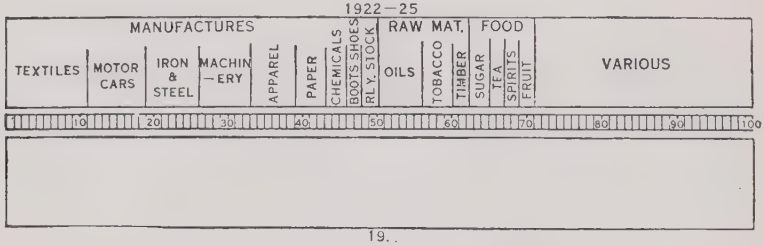

FIG. 93.—The imports of New Zealand.

Direction of Trade.—Taking the average of the years 1921–25, about 80 per cent. of the exports go to the United Kingdom; and more than 50 per cent. of the imports are received therefrom.

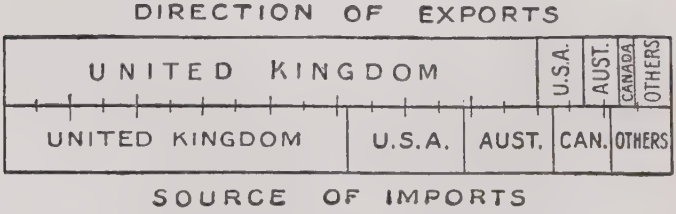

FIG. 94.—Direction of New Zealand's foreign trade, 1924.

The United States takes about 7 per cent. of the exports and supplies 15 per cent. of the imports; Australia takes 7 per cent. of the exports and supplies about 13 per cent. of the imports. The

remarkably close trade connections between New Zealand and the Mother Country is particularly noteworthy. Over 90 per cent. of the traffic is carried in British ships.

Ports.—The leading ports of New Zealand are Auckland and Wellington, close rivals in the import trade and receiving over 60 per cent. of the whole. Other importing centres in order are: Lyttelton, Dunedin, Invercargill, and Napier. The export trade is more evenly distributed, though more than 50 per cent. is handled by Wellington and Auckland. The others in order are: Lyttelton, Napier, Dunedin, Invercargill, Wanganui, Timaru, Gisborne, and New Plymouth.

THE NATURAL REGIONS OF NEW ZEALAND

The division of New Zealand into provinces is largely the result of the early days when separate parliaments governed in their own little spheres. A region clearly marked off by nature became a distinct unit politically. There is, therefore, a fairly close correlation in New Zealand between the natural regions and the provinces. In many cases the divisions between provinces are also the divisions between natural regions, but provincial divisions are no longer used officially.

THE NORTH ISLAND

North Auckland, including the Auckland Peninsula.—The province of Auckland is the largest and most northerly in New Zealand, and covers nearly a quarter of the whole of the Dominion. It corresponds roughly with the climatic region which has a modified Mediterranean type of climate with a winter rainfall maximum. The northern warmer region corresponds roughly with the Auckland Peninsula, but includes also a very important tract of lowland south of the city of Auckland.

North Auckland is the home of the giant kauri, one of the finest timbers in the world, and once highly esteemed by reason of the magnificent masts for sailing ships which it made. The kauri exudes a clear gummy fluid, which hardens as it dries and drops off the trees into the soil. "Kauri-gum" is thus obtained by digging not only in the soil of the existing forests but in many regions where the kauri formerly existed. It is also possible to obtain supplies by regular tapping of growing trees. Its value lies in its use in varnish making. Although large areas of kauri forest are now rare, there are many other fine forests left, and timber milling is an important industry.

The absence of frosts allows the growth of such Mediterranean trees as the orange, lemon, olive, and vine; whilst deciduous fruits (apples and pears) flourish. But Auckland is pre-eminently a dairying province, and dairying is the leading industry.

We may include in the natural region now under discussion (though it lies outside North Auckland) the hilly peninsula known

as the Cape Colville Peninsula. This is the great gold-mining area of New Zealand, and has yielded half the gold found in the Dominion. Agriculture is here making rapid strides.

Auckland (population 192,000 in 1926), the largest city in New

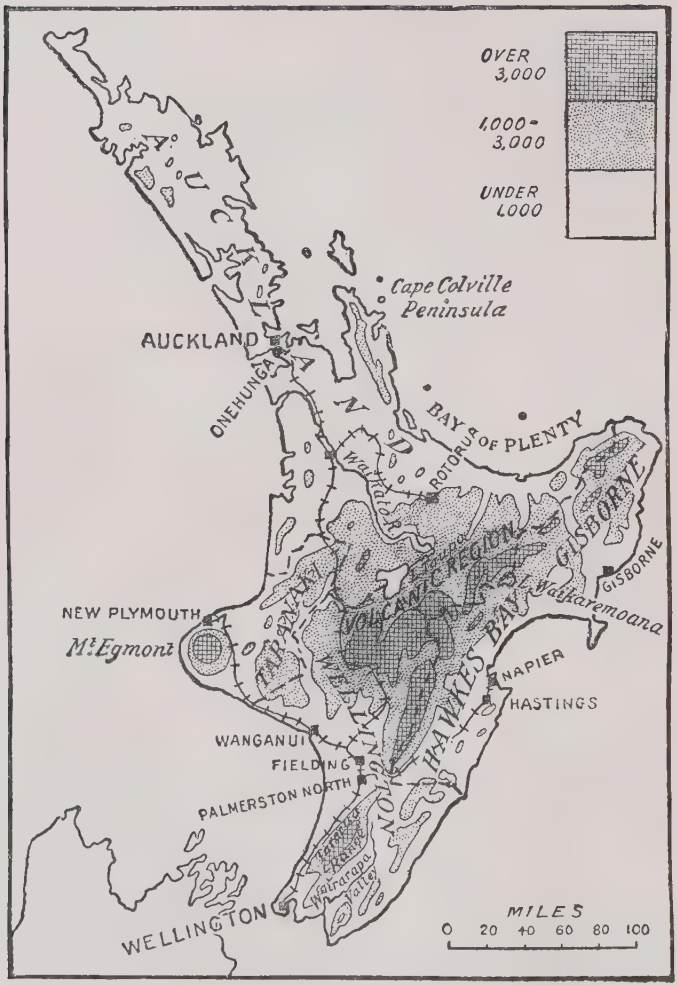

FIG. 95.—The North Island.

Zealand, is situated on the fine Waitemata Harbour, where the isthmus is only about half a dozen miles wide. It has the advantage of a second but much shallower harbour at Onehunga, on the southern (or south-western) side of the isthmus. Auckland is connected by rail with Wellington, 426 miles away, as well as with the northern

part of the peninsula. Situated as it is towards the northern end of New Zealand, Auckland is nearer the great ports of North America, San Francisco and Vancouver, than are the other ports of New Zealand. This is one reason why it is a popular port of call for liners between Australia and America. *Hamilton* (16,000 in 1926) lies south of Auckland at the head of navigation of the Waikato River. It is the business centre of a prosperous agricultural and dairying country.

The Volcanic Region of the North Island.—Forming roughly the centre of the volcanic region is Lake Taupo. The northern half lies in Auckland province, the southern half in Wellington, the western fringe in Taranaki. To the north is Rotorua, the centre of New Zealand's geyserland and a well-known health resort and spa. To the south of the region are the volcanic giants Ruapehu, Ngauruhoe, and Tongariro. The western part of the volcanic region is sometimes called by New Zealanders the "Main Trunk District." Through it passes the main trunk railway from Auckland to Wellington, and the area is a great stretch of fine forest country, for long the domain of a warlike Maori chief.

Taranaki and the Western Portion of Wellington.—The lowlands of the south-western part of the North Island are very fertile and important. Taranaki is a province of dairy farms, many of them under the shadow of the beautiful snow-capped volcano, Mount Egmont. There are many up-to-date dairy factories, and the further development of hydro-electric power will continue to improve the quantity and quality of the output of milk, butter, and cheese.

New Plymouth (16,000 in 1926) is the capital and principal port of Taranaki, and has an artificial harbour, though partly protected by natural features. Wellington is one of the most productive provinces in the Dominion, and west of the mountain divide dairying is the leading occupation ; there is also a varied agriculture, and the province leads in the production of New Zealand flax. Great flax swamps are passed by the railway going northwards from Wellington. Palmerston North (20,000), Feilding, and Wanganui (26,000) are the centres for the region. *Wellington* (121,000 in 1926), the capital of New Zealand, is well situated on the large deep harbour of Port Nicholson. Notice the fine central position of Wellington and its ability to serve as the outlet for both east and west coasts.

The East Coast.—The east coast corresponds exactly with the old land district of Hawke's Bay and that part of Wellington lying east of the Tararua Range. The province includes also part of the shores of the Bay of Plenty. We have already learnt that the east side is the dry side of New Zealand and, as we should expect, the great sheep-farming centre of the Dominion. This is true of Hawke's

Bay as well as of many parts of eastern Wellington. In the rich Wairarapa Valley of Wellington and the plain of south-western Hawke's Bay dairying is rapidly increasing in importance. Apples, pears, and peaches grow well, while the sunny climate and sheltered position make vine-growing and wine-making possible.

Napier (18,000 in 1926) is the principal town and port. *Hastings* (15,000 in 1926) is a growing centre fourteen miles to the south. Electric power for the whole of the east coast will be provided by the works utilizing the outfall from Lake Waikaremoana. *Gisborne* (15,000 in 1926) is the centre of the northern part of the east coast.

SOUTH ISLAND

The West Coast.—Lying between the crest of the Southern Alps and the sea is the province of Westland. In the middle of the west coast there is a narrow coastal plain, but southwards the mountains come right to the coast, and one passes into the beautiful fjord country of Southland. The northern part of the west coast lies in the province of Nelson, but the fertile sheltered part of this province lies round the shores of Tasman Bay. The west-coast region as a whole is a very wet one; all parts have upwards of 75 inches of rain. The lower slopes of the mountains—most of the province of Westland—are forested and sparsely populated, whilst the higher parts of the mountains and the fjord country may be described as uninhabited. The scenery of much of the coast and mountains is very fine; the Franz Josef and Fox Glaciers descend to within 700 feet of sea-level. *Hokitika* is the starting-point for tourists visiting the glaciers. Although dairying is being developed, the chief importance of the west coast lies in its mineral resources. The two leading coal fields are round the coal ports of Greymouth and Westport. In the 'sixties of last century "gold rushes" to the rich alluvial gold fields were the means of settling the country, and a little gold is still obtained, especially near Reefton. The piercing of the Southern Alps by the Arthur's Pass tunnel (the longest tunnel in the British Empire) has placed the west-coast coal fields in direct touch with the Canterbury Plains, and should do much to develop the country.

Marlborough and Tasman Bay.—The north end of the South Island is cut off by mountain ranges from the west coast and from the Canterbury Plains, and can be considered as forming a distinct region. The provinces as a whole are hilly and the small areas of good, flat land have become the centres of development. In Nelson, around the mild and sunny shores of Tasman Bay, a busy fruit-growing area has developed. *Nelson* (12,000 in 1926) is the centre of the industry, and an export trade in apples and pears (sent to England and South America) has been built up of recent years.

Hops grow well in the same region. Cement is manufactured at Golden Bay, and the iron ore of Parapara is being developed. In Marlborough the climate is drier, but the plains are more extensive. The Wairau Plain was an early area of settlement, and grows excellent barley, as well as seed peas for distribution through the Dominion. The hills of Marlborough Province support large numbers of sheep.

FIG. 96.—The South Island.

Blenheim, the business centre, is four hours by steamer from Wellington across the Cook Strait.

The Canterbury Plains and Downs.—The Canterbury Province is one well marked off by nature and really consists of four parts :

(*a*) The slopes and spurs of the Southern Alps with their beautiful glacial lakes.

(*b*) A belt of undulating country—the "Downs" between the mountains and the plain. This downland approaches close to the coast at both the northern and southern ends of the province.

(*c*) The Canterbury Plains, a broad, gently undulating, gravel plain, occupying the centre of the east coast.

(*d*) The hilly Banks Peninsula, attracting a heavier rainfall than that found on the Canterbury Plains.

The whole province lies on the lee side of the Southern Alps, and so is the driest province in New Zealand. Nearly all the plainland receives less than 25 inches of rain a year. The Canterbury Plains may be described as the chief grain-growing district of the Dominion. The leading cereal is wheat, and average yields are high. Other crops are clover, peas, and grasses—often grown for seed purposes. Generally speaking, the hill country is utilized for sheep-raising, but large numbers of sheep are sent annually to the rich Canterbury Plains for fattening. Hence, the high quality of mutton from the region. Dairying is being developed and fruits grow well.

Christchurch (118,500 in 1926), with its port Lyttelton, is the centre of this rich region. Lyttelton is reached by a frequent service of fast steamers from Wellington, and from Lyttelton and Christchurch there is railway communication as far as Invercargill in the extreme south.

Ashburton, *Timaru* (17,000), and *Oamaru* are prosperous centres of the plains.

Otago and Southland.—Otago consists mainly of a plateau of ancient rocks, deeply cut into by valleys largely of glacial origin. The plateau is continued into Southland and on the west coast includes the beautiful fjord country. On the south-east coast there are several fertile plains, in which the population is concentrated. It was the discovery of gold which first attracted settlers to Otago—in the 'sixties of last century—and *Dunedin* (85,000 in 1926) for a time became the commercial centre of New Zealand. The prosperity of the region now depends mainly on sheep-rearing and agriculture. The hill country affords pasturage to large numbers of sheep, whilst the fertile plains are being given over more and more to agriculture. The Taieri plains, south of Dunedin, and the plains of Southland grow oats ; barley grows well round the beautiful inland lakes, which incidentally attract numerous tourists. Central Otago is celebrated for its fine fruit ; some parts are sufficiently dry to need irrigation. *Invercargill* (22,000 in 1926) is the leading town of Southland, and is separated by a few miles from its port, known as *The Bluff*.

DEPENDENCIES OF NEW ZEALAND

The Cook Islands.—The Cook Islands were attached to the government of New Zealand in 1901. There are twelve inhabited islands (including Niue) with a total population of 13,200. Of these

3,750 are in Niue and 3,500 in Rarotonga. Wireless stations are now established on four of the islands. The leading exports are copra, oranges, bananas, tomatoes, and other fruits.

Nauru.—Nauru, or Pleasant Island, lies nearly on the equator. Before the Great War it was a German possession. It is of con-

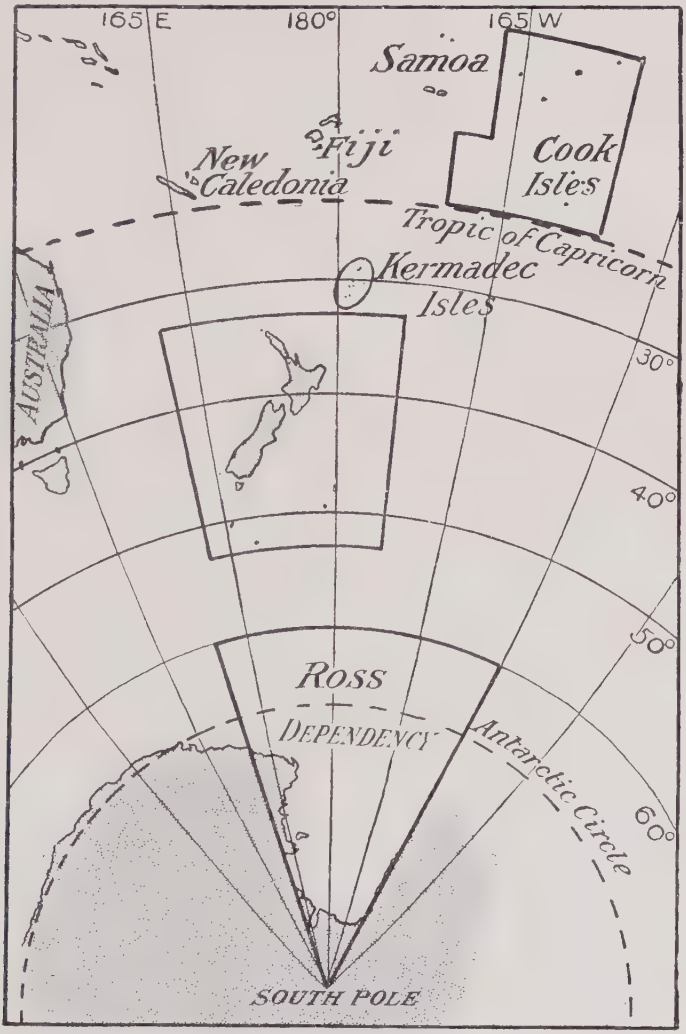

FIG. 97.—The Dominion of New Zealand and its Dependencies.

siderable importance, owing to the rich deposits of phosphate. Between 1921 and 1925 an average of nearly 400,000 tons a year of phosphate was exported from Nauru and Ocean Islands, mainly

to Australia, New Zealand, and Japan. The deposits in the two islands are estimated to contain 100 million tons. The yearly production of phosphate is divided between the governments of Great Britain, Australia, and New Zealand in the proportion of 42, 42, and 16. It is of great importance to Australian agriculture.

The Union Group.—The Union Group is also administered by New Zealand. The islands are inhabited by about a thousand natives, and produce copra.

Western Samoa.—The former German islands of Western Samoa are administered by New Zealand under mandate from the League of Nations. They lie in tropical waters 1,700 miles northeast of New Zealand. There are two main islands, Upolu (430 square miles) and Savaii (703 square miles). Upolu is covered with luxuriant tropical vegetation; it abounds in fertile valleys with swift mountain streams. There are now extensive plantations of coconuts and cacao. There are 36,000 inhabitants in the island, including 2,000 Europeans. Apia is the principal town; copra and cacao beans are the only exports of importance. The island of Savaii, though larger, is very mountainous (rising to 4,000 feet) and is less productive.

OTHER PACIFIC ISLANDS

The Fiji Islands belong to the British Empire, and lie on the trade routes between Australia and New Zealand on the one side, and Canada and the United States on the other.

New Caledonia is a French possession, formerly used as a convict settlement. It has large deposits of nickel ore.

The Hawaiian Islands belong to the United States. The principal town, Honolulu, is now a large city, and an important port of call for liners crossing the Pacific. The islands are famous for their pineapple plantations; the tinning and export of pineapples is now a large industry. There is a famous active volcano, Mauna Loa, on one of the islands, and on its flanks is a subsidiary volcano (Kilauea), of which the crater is occupied by a lake of molten lava which can actually be visited and studied.

Other Islands.—Some of the tiny islands of the Pacific are used as "signal stations." They are equipped with wireless apparatus and pass on messages received from ships. Examples of islands used for this purpose are Thursday Island, Norfolk Island, Fanning Island (also cable stations), Ocean Island, etc.

NEW GUINEA

The island of New Guinea is sometimes described as the largest in the world. It is nearly 1,500 miles long, and has an area of about 300,000 square miles. It is situated in the region of equatorial

climate, and the lowlands are covered with hot, wet, evergreen forests. The interior is occupied by a very lofty plateau, said to be covered with dense tropical grassland. The western part of the island is part of the Dutch East Indies ; the south-east, under the title of Papua, is administered by Australia ; whilst the north-east, now known as the Territory of New Guinea, was formerly a German possession, and is now administered under mandate by the Australian Commonwealth.

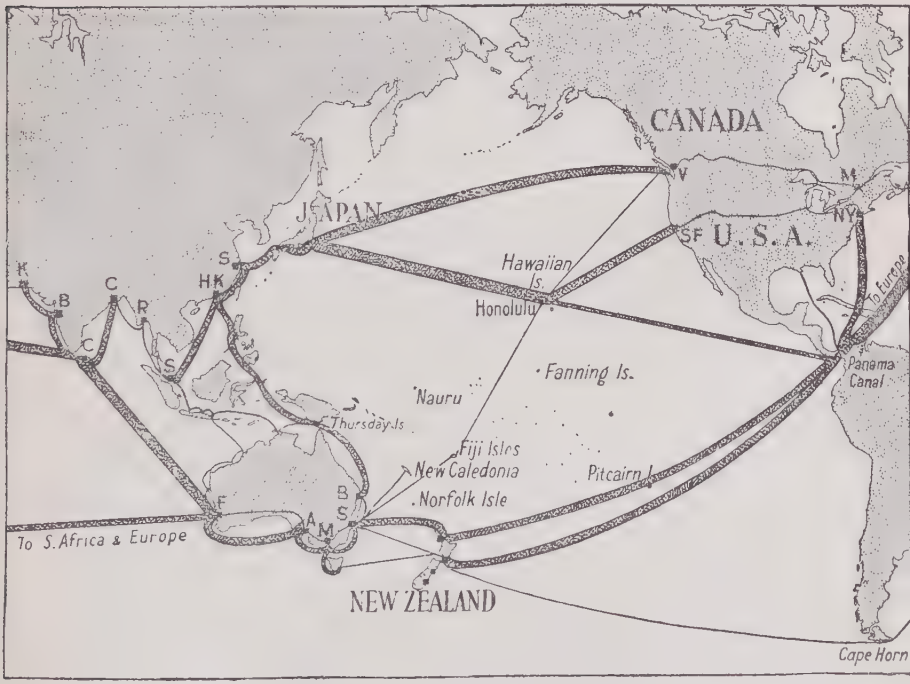

Fig. 98.—Trade routes of the Pacific Ocean.

Many of the inhabitants of New Guinea are wild, cannibal tribes, and the interior of it is still little known. The white population is slowly increasing, and both in Papua and New Guinea plantations are extending, especially those of coconuts and rubber. Minerals, including gold and oil, are believed to exist in payable quantities. Included under the mandated territory are the Bismarck Archipelago and the Solomon Islands.

ANTARCTICA

The barren Antarctic continent consists probably of a high plateau of land, but for the most part is covered by a great depth of

ice and snow. Under the name of the Ross Dependency a large sector has been placed under the government of New Zealand. The whale-fishing industry is one of great value in the territorial waters, and is being exploited mainly by Norwegians under licence from the New Zealand government.

EXERCISES

1. The Foreign Trade of the Commonwealth of Australia—Figs. 47 to 52—should be kept up to date from the *Annual Reports on the Balance of Trade* or the *Statesman's Year Book*.

2. Other statements and figures in the section on Australia may be checked from the *Official Year Book of the Commonwealth of Australia*.

3. The Foreign Trade of New Zealand. Keep up to date from the *Annual Reports on the Balance of Trade* or the *New Zealand Official Year Book*.

EXAMINATION QUESTIONS

1. Compare and contrast the sheep-rearing industry of Australia with that of New Zealand. (*Univ. London Inter. B. Com.*, 1925.)

2. Compare and contrast railway development and railway communications in North America and Australia. (*Univ. London Inter. B. Com.*, 1927.)

3. Suggest a scheme of railway development for Australia. (*Univ. Oxford Dipl.*, 1926.)

4. Describe and account for the arrangement of vegetation zones around the arid interior of Australia. (*Univ. Oxford Dipl.*, 1926.)

5. How far may the Murray-Darling lowlands be said to constitute a single Natural Region ? (*Univ. Oxford Dipl.*, 1926.)

6. Outline the outstanding geographic factors which have determined Australia's economic development. (*Univ. Toronto 1st Year Hons.*, 1925.)

7. *Either*, Compare the physical character and economic development of the lowland regions in the two main islands of New Zealand. (*Univ. Oxford Cert.*, 1926.)

Or, Discuss the geographical factors affecting the distribution of (*a*) sheep in South, and (*b*) cattle in North Island, N.Z. (*Univ. Oxford Cert.*, 1926.)

8. Compare the climates of the North and South Islands of New Zealand. To what extent does the climate of the North Island conform to the Mediterranean type ? (*Univ. Oxford Dipl.*, 1926.)

9. Trace the effect of the configuration of *either* the South Island of New Zealand, *or* Eastern Australia upon the distribution of population and the position and growth of towns. (*Univ. Oxford Dipl.*, 1926.)

10. Discuss on a geographical basis the problem of the peopling of tropical Australia. (*Univ. Oxford Dipl.*, 1926.)

11. Discuss the population problem in either Australia or the Argentine as regards distribution, immigration and racial elements. (*Univ. Sheffield B.Sc.*, 1925.)

12. What is an artesian basin ? Discuss the *rôle* of artesian basins in the present and the future development of Australia. (*Univ. London Inter. B. Com.*, 1927.)

13. Discuss the factors that are likely to help and to hinder the closer settlement of Australia. (*Univ. London Inter. Arts*, 1927.)

14. Write a short geographical account of *either* South Island, New Zealand *or* Nova Scotia. (*Univ. London Inter. Arts*, 1927.)

15. What geographical factors favour the development of manufacturing industries in S.E. Australia? (*Univ. London Inter. Arts*, 1928.)

16. Discuss the geographical facts that underlie the following figures of distribution of population: Queensland (1921), 1·1 per sq. mile; New South Wales (1921), 6·8 per sq. mile; Kiangsu Province (mouth of Yangtze Kiang), 4,000 per sq. mile. (*Univ. London Inter. Arts*, 1928.)

17. Compare and contrast Tasmania and the South Island of New Zealand as regards climate and agriculture. (*Central Welsh Board, Higher Cert.*, 1927.)

18. New Zealand is said to be far more like Britain than is Australia, and therefore to be more easily settled by British emigrants. Comment on this statement. (*Central Welsh Board, Higher Cert.*, 1927.)

19. Give an account *either* of the Northern Territory of Australia, *or* of the economic development of the interior of Queensland. (*Central Welsh Board, Higher Cert.*, 1927.)

20. Compare the effectiveness of rail and boat communications between Australia's capital cities. (*Central Welsh Board, Higher Cert.*, 1927.)

21. Describe *either* (*a*) the gradations of climate along the coast of Queensland from Cape York to Brisbane, *or* (*b*) the Murray-Darling basin with special reference to its climates and their bearing upon economic development, *or* (*c*) Northern Australia with special reference to its climate. (*Central Welsh Board, Higher Cert.*, 1929.)

22. Give some account of *either* (*a*) the indigenous forms of plant life, *or* (*b*) the indigenous animal life of Australia. (*Central Welsh Board, Higher Cert.*, 1929.)

23. Give some account *either* (*a*) of the distribution and the varied forms of stock-raising practised in Australia, *or* (*b*) of the production of fruit and wine for commercial purposes in Australia. (*Central Welsh Board, Higher Cert.*, 1929.)

24. Compare the Eastern Highlands of Australia with the Cordillera of South America. (*Central Welsh Board, Higher Cert.*, 1929.)

25. Compare the climates of Ceylon and South Island, New Zealand. (*Joint Matric. Board, Higher School Cert.*, 1929.)

26. Give a reasoned account of the present distribution in Australia of the chief areas devoted to *either* (i) sheep, (ii) dairy cattle, *or* (i) fruit, (ii) wheat. (*Joint Matric. Board, Higher School Cert.*, 1929.)

27. Write a brief geographical description of the State of Victoria. (*Univ. London Inter. Arts*, 1928.)

28. How far is it true to say that "remoteness" has always been an obstacle to rapid development of population in Australia? (*Univ. London Inter. Arts & Sci.*, 1929.)

29. Give reasons for the fact that Queensland is the only Australian state in which the value of its trade with the other states of the Commonwealth is greater than that of its overseas trade. (*Joint Matric. Board, Higher School Cert.*, 1928.)

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